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THE EFFECT OF PERCEPTUAL TRAINING UPON THE DRAWINGS OF FIRST GRADE CHILDREN

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled The Effect of Perceptual Training Upon the Drawings of First Grade Children submitted by R. Keith Muirhead in partial fulfilment of the requirements for the degree of Master of Education

ABSTRACT

The purpose of this study was to determine if perceptual training presented in conjunction with drawing instruction would increase the visual information content of first-grade children's drawings significantly more than participation in drawing activities without directed perceptual training.

Two grade one classes which were considered comparable on the basis of socio-economic status, age, and I.Q. estimates were selected to participate in the study. The study consisted of eight thirty minute lessons--two per week--over a total of four weeks. One class was designated as the experimental group and the other as the control group. The experimental group received sequential demonstration-participation activities in locating and differentiating between points of maximal information prior to drawing visual objects. The control group was given conventional drawing activities in drawing the same visual objects as the experimental group. The instruction was conducted by the researcher under normal classroom conditions holding all known instructional variables constant with the exception of perceptual training. The drawings were rated by the researcher and three other independent judges on the basis of a fifteen point rating scale.

The results of this study were inconclusive. Pre and post-test scores indicated that perceptual training relevant to the utilization of visual cues located along contour lines did not

increase the amount of visual information first-grade children include in their drawings of visual objects as measured by the experimental criteria. Analysis of drawings other than the post-test items indicated that perceptual training did increase the amount of visual information the experimental group included in drawings of objects as measured by the experimental criteria. One analysis showed that the perceptual training had an immediate effect on the amount of visual information the children included in their drawings while another analysis indicated that the effects of perceptual learning can be transferred to unfamiliar objects.

It is believed that students lost interest in post-drawing activities, thus accounting for the apparent lack of growth when rated on post-test drawings.

While the results of this study were mixed it did indicate that perceptual training relevant to representational drawing can increase the amount of visual information first-grade children include in their drawings of visual stimuli. Sufficient data was obtained from this study to warrant continued investigation of this form of perceptual training.

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CHAPTER I

INTRODUCTION

As of yet relatively little is known about the process of human perception.[1] Studies in the psychology of perception, however, have provided ample evidence that perceptual growth is in part a result of learning. Bruner (1966), in reporting on his extensive studies in perception and cognition and drawing upon studies in human ontogenetic development by investigators working in centers as varied as Geneva, Moscow, Paris, London, Montreal, Chicago, and Cambridge, concluded that the biological development of the individual includes a complex of capacities which develops at different rates. These capacities (including the perceptual capacity), he says, are not clearly linked to age and may be accelerated or retarded by the environment. Bruner supports the theory that one does not wait for readiness but teaches for, or provides opportunities for, its nurture. Readiness (one's over-all preparation for performing a task) permits mastery of more elaborate skills.

Since a very large portion of a school-aged child's life is spent in school, it has been a continuing concern of educators to determine how and to what extent the psychological and physical environment of schools affect the personality development of children. Furthermore, educators have been concerned with manipulating

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[1] The term perception as used by the writer refers to visual perception.

and experimenting with environmental variables associated with education so as to develop behavior and skills which will prepare children for more complex tasks. Since the teacher is an important part of the child's cultural environment, he is consequently in a position to affect the child's personality, to direct perception, and thus affect the nature of child art. Associated with this aspect of teacher influence is the current problem in art education of determining the extent to which the abilities to handle visual information may be improved if specific tasks in perceptual training are utilized as part of the art program. According to Lansing (1970) formal training in visual perception seems especially important for the primary-aged child or the visually inexperienced child such as the culturally disadvantaved (p. 126). Furthermore, the longer readiness training in perceptual skills is put off, the more difficult it becomes for a child to master more elaborate skills.

Barkan and Chapman (1967) stress the importance of developing the child's perceptual abilities when they list description as an aspect of their "Major Goal of Learning to See and Understand Art," particularly in conjunction with teaching materials and teaching activities. Description is a form of visual training which will aid the child in overcoming habitual ways of perceiving, so that new ways of looking can be developed. Rueschhoff and Swartz (1969) also encourage the development of the child's perceptual awareness through emphasizing the relationship between the child and environment. They say:

> When children are able to see more because they know more, when they have developed enhanced visual perception, they have acquired a foundation for

> making intelligent and evaluative observations of the visual world and for forming aesthetic judgements and discriminations about it. (p. 4).

Accepting that art experiences are concerned with developing visual observation and judgement, it would appear that investigations of perceptual training should be carried out in the school art program. In this researcher's view, the child's visual perceptual growth should not be left to chance of maturation. Steps therefore should be taken to ascertain whether or not learning strategies will take children beyond the perceptual skills vicariously and haphazardly acquired through the cultural and physical environment and to what degree they can be meaningfully developed and presented as part of the art program. The extent to which participation in a particular kind of art activity may affect visual perception remains open to question.

Statement of the Problem

The purpose of this study was to determine if participation in a specific kind of perceptual training would increase the visual information content of primary-aged children's drawings significantly more than participation in drawing activities without direct perceptual training.

Questions to be Answered

1. What effects will a basic form of perceptual training have upon grade one children's drawings?

2. Will perceptual training presented in conjunction with drawing instruction increase the visual information content of grade one children's drawings significantly more than participation in drawing activities without formal perceptual training?
3. Will perceptual training affect first grade children's ability to observe and draw unfamiliar objects?

Need For the Study

Research studies have indicated that certain visual functions can be improved through instruction which develops the ability to observe and respond selectively to visual stimuli. For example, in a review of the research of perceptual learning, Gibson (1953) has concluded that such learning is not only possible but that certain aspects of it may be improved with practice and with reinforcement of correct responses. In a more recent study, Salome (1966) has shown empirically that training aimed at getting fourth and fifth grade children to perceive visual cues located along contour lines will increase the amount of visual information that they use in their drawings.

These and other findings have led this researcher to believe that direct perceptual training should be a specific objective for which one must teach and that it should be started early in a child's formal education. By the time the child enters school he is not void

of perceptual skills. Limitations of object perception at this age, however, suggest the school art program can do much to enrich and refine visual sensitivity. According to Lansing (1970), it is during the age of three to seven that the child's motor development continues to improve and his perceptual activities increase. Salome (1968) in discussing perceptual training in reading readiness and its implications for art discovered similar findings. The significant findings were that maximum perceptual development in the areas measured occurs between the ages of four and seven with less growth after the age of seven and a half when cognitive functions begin to predominate. Since grade one children generally fall within the four to seven age category there is a need for a concentrated effort to be made to foster perceptual awareness from the time the child first enters school. This study was designed to determine if perceptual training would increase the amount of visual information grade one students included in their drawings.

Procedure Followed

Forty-nine grade one children participated in a four week experiment. One class designated as the control group received six lessons that were termed as Controlled Drawing Activities, while the other class designated as the Perceptual Training group was given demonstration-participation exercises in observing contour lines and locating points of maximal information. All students were asked to draw the same objects prior to, during, and immediately after the experimental period. These drawings were used to measure differences

in the amount of visual information included as a result of either controlled drawing instruction or perceptual training. In addition to drawing the test items, the children were asked to draw an unfamiliar object at the end of the training period. The purpose of this activity was to determine if there was a transfer of the perceptual skills acquired as a result of training to a non-test stimulus. Following procedures to conceal the identity of individual drawings, the researcher and three other judges independently evaluated the drawings.

Limitations of the Study

In interpreting the data of this research the following limitations should be borne in mind:

1. The results of this study were based upon the instruction provided by one teacher in one school at one grade level.
2. Relationships were determined on the basis of a four week treatment period.
3. Media and stimulus objects were restricted to facilitate examination of treatment effects.

Definition of Terms

1. Controlled Drawing Activities. There is no statistical information as to what the average first grade art experiences and teaching strategies consist of. Therefore, for the purposes of this study, the recommended

processes as set forth in the 1969 Alberta Elementary Art Curriculum Guide were used to define the procedures used with the control group.

2. Perceptual Training. For the purpose of this study perceptual training will be to direct attention to visual cues located along:

   (A) contour lines--outer edges or boundaries of shapes and patterns which can be described with a linear drawing tool such as a crayon. Contour lines may be found at places of abrupt texture or color change within the object as well as at the outer edges of shapes.

   (b) points of maximal information--those points on a contour line where direction changes most rapidly such as at angles and peaks of curvature (Atteneave 1954, p. 184-185). These points of information must be identified in rendering a representational linear drawing.

3. Perceptual Development. McFee (1961) refers to the development of visual perception as: "...the increase in the ability to use the visual information that is available to organize and synthesize it so that we can respond." (p. 78) This study will be concerned with the ability to utilize the visual information located at

points of maximal information of objects in order to produce representational drawings of those objects.

4. Visual Information. This term designates the stimuli received by the eye when looking at an object. The stimulus object may provide many different visual cues; however, the students who receive the perceprual training will be encouraged to base their drawings upon visual information found at points of maximal information.

Statistical Procedures

The research led to several hypotheses which were answered with appropriate tests[1]. All data were collected by the researcher and processed on the IBM 360 machine at the University of Alberta

In summary it is evident from the research available that the development of visual perception is affected by the environment. Since the school-aged child spends much of his time in the school environment it follows that teachers are in a position to enhance the development of the child's visual perception. The purpose of this study was to determine if perception taught in conjunction with drawing instruction would increase the visual content of grade

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[1] A complete discussion of the hypotheses and statistical procedures will be dealt with in Chapter III.

one children's drawings.

Chapter II will be devoted to a discussion of literature dealing with cultural studies; implications from the psychology of perception and a review of educational research studies related to the development of visual perception.

CHAPTER II

RELATED RESEARCH

According to the evidence presented by experimental psychologists, the past experiences of an individual play an important part in the process of perceiving. Cultural experiences, (habits, attitudes, values) and past perceptual training are among those past experiences which affect perceptual responses. Based on the findings of the experimental psychologists, Wilson (1966) explains that the individual builds up certain assumptions about the world in which he lives, and because there are differences in the assumptions of individuals due to differences in their past experiences, there are consequently differences in perception. This would suggest that many deficiencies in the child's visual perception may develop and become habitual. It would appear, therefore, that the school art program might provide a formal kind of perceptual training which would enhance and refine the student's information handling ability. This would seem particularly important in a culture such as our own which provides children with many diverse forms of prior training and experiences.

Cultural Studies

Available evidence indicates that cultural experiences and values may provide an informal perceptual training which influences the way that children utilize information in their

drawings. The culture influences the direction of perceptual training by giving many more opportunities and rewards for observing the things important to the group than for observing those that are not. This was demonstrated by the research of Anastasi and Foley (1936). They analyzed the cultural influences on children's art behavior and found that different environments produced different types of art in children of the same age. Differences were observed in the amount of detail, subjects, colors, and complexity of organization. The quality of drawings they concluded, related closely to the importance which a culture attaches to a particular kind of behavior or objects. By looking at ways of life that are very different from our own, the effects of enculturation on perceiving and on child art become evident.

Behrens (1969) illustrated the effects of enculturation on perception by comparing Western Civilization with that of the Zulus. Western Civilization, he says, has been described as a linear culture, based on the bias of Euclidean space and mechanical perspective. In contrast, the Zulu world is one of non-perspective. According to Gregory cited in Behrens (1966):

> ...(Zulu) huts are round, and have round doors; they do not plough their land in straight furrows but in curves; and few of their possessions have corners or straight lines. (p. 14)

Behrens explains that as a result, many of our so-called visual illusions based on suggested perspective and straight lines are not perceived as illusions by the Zulus. Apparently since they know nothing of straight lines there is no interference between visual and cognitive learning.

Belo (1955) conducted a three month study of the art of Balinese children and found that these children draw like children in other cultures until they reach the age of four or five. At this age they adopt the culturally accepted techniques and subject matter. The Balinese culture, Belo says, is rich in art forms and consequently the children are exposed to art from infancy, especially to wajang puppet shows. The puppet shows introduce the children to stylized figures that represent heroes, demons, and other characters that have an important place in the Balinese traditions. Consequently, when these children are asked to draw, they commonly produce the stylized figures from the wajang puppet shows. Thus it is clear that the matter and the style of child art in Bali is strongly influenced by the cultural environment. It causes the children to perceive certain things intently and to think of those things during the act of drawing.

Havighurst and Neugarten (1955) explain that among the Zia Indians of New Mexico a marked difference in the drawing ability of boys and girls has been observed. The difference they say becomes apparent in the first grade and continues throughout life. This difference is due to the fact that the boys are expected to draw and paint animal pictures on walls and to paint ceremonial masks and other objects, but that girls are expected only to make geometric designs on pottery. As a result, the boys perceive things with more care and draw them in greater detail than the girls do. The culture, therefore, influences the extent to which these youngsters perceive and conceive, and it affects the extent of their development in art.

Schubert (1930) offers a good illustration of how the ordinary environment can affect the direction of perceptual development in her study of the drawings of Orotchen children of Northern Siberia. She explains that among the Orotchens, the reindeer is the central factor in the culture, and observations of the reindeer are reinforced throughout the life of the child. Consequently their drawings show the influence of sharpened visual perception and keen observation. This seems to indicate that the values of the culture tend to influence what the children see and ultimately what they know. The values of the Orotchens are apparently of the sort that causes them to pay attention to the appearance or to the aesthetic aspect of the reindeer. Hence they are cognisant of the things that facilitate the drawing of such animals.

McFee (1961) explains that in cultures where a strong system of visual symbolic communication has been developed the children's drawings tend to approach the "symbolic realism" of the culture. This is evident by the stylized drawings of the Balinese children. In the case of the Orotchen tribe, there was no system of communicating through symbols in the culture. Yet the children's perceptions of the highly-valued reindeer were so acute that they were able, without instruction, to draw them in detail. In drawing objects like the human figure, they tended to pay little attention to detail and depicted humans using the crudest form of symbolism. The cultural values acted as directors that accelerated their drawing ability of some objects and neglected it in others.

According to Wolfenstein (1954) French children's art work is highly controlled, detailed and patterned. Wolfenstein

suggests that such qualities are the result of child rearing practices in which strong restraints are levied on the overt drives of children. Freedom and pleasures are more apparent in adult behavior and consequently in adult art. Lansing (1970) reports that other art educators have also noticed the high degree of control in French children's art work. He explains that cultural influences cause the children to control themselves in thought and action as they make their paintings, and their paintings reflect a certain amount of that control.

Merritt (1964) examined the effect of environment on Japanese children's art and concluded that the remarkable vitality and variety in their work can be explained by the rich respect for art that is demonstrated by the Japanese people. According to Merritt the adults of the Japanese culture consider art to be a natural means of expression for everyone, and they freely produce it. As a result, the children are surrounded by artistic activity, and by tasteful visual arrangements from birth onward. They are conditioned to perceive the aesthetic dimensions of experience, and their high level of sensitivity reveals itself in art work that has a considerable degree of differentiation.

Clearly the cultural and physical environment plays a part in determining the nature of child art because they provide an informal kind of perceptual training which influences the way that children utilize information in their art. Within the national culture are many subcultures however, each of which can also influence child art. In a four-year study of college students,

Ikeda (1964), for example, found that informal social groups or subcultures can cause an individual to focus attention on art and develop a knowledge of art. In a complex country such as Canada, the variations among subcultures are very great. The family, the neighborhood, and the school classroom are examples of these social units that are often described as subcultures. These social units, can and do, affect child art and since the teacher is part of the classroom, he is part of the child's cultural environment. Consequently the teacher is in a position to direct perception and affect the nature of child art.

The perceptions that people have of what they see are unique; thus reflecting the character of "training" each has received; that is what one perceives and how it is perceived is learned. What and how one perceives is determined in part from learned habits, attitudes, values, and from the formal and informal education received in participating in a particular cultural environment and subcultures. This learning results in individualized "sets"[1] or assumptions about the world in which one lives and ultimately determines how one perceives his world. There is a need therefore to establish a common basis for acquiring perceptual information so as to enhance and refine the individual's information handling process.

Implications From the Psychology of Perception

According to the research of cognitively oriented theorists

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[1] McFee (1966) defines set as, the habitual tendencies to respond in certain ways to things in our environment.

such as Bruner, individual perceptions are selective. Rather than responding to all the visual stimuli impinging upon the retina the tendency is to handle new information in terms of learning that has already occurred.

These visual habits of perception are necessary for one to deal efficiently with the large volume of stimuli one is confronted with, but it may result in habitual ways of perceiving which are incomplete. It would therefore, seem important to determine if a child can be taught to deal with visual detail in a selective manner so as to enhance his ability to perceive objectively. The psychological research studies which follow support the notion that sets can be taught.

Carmichael, Hogan, and Walter (1932) demonstrated that perceptual readiness may be created by suggestion or instruction. In their study two groups of subjects were given different instructions as to what was about to appear on a screen for a short duration. The stimulus figure that did appear on the screen was an ambiguous drawing that had some of both qualities. After the figure appeared, the subjects were asked to draw what they had seen. Their drawings were very markedly altered in the direction of their prior expectations.

In a similar study Slipola (1935) demonstrated that selectivity in perception may be present before the appearance of a stimulus object. Subjects were given instruction pertaining to the meaning of words they were to see flashed on a screen by means of a tachistoscope. The experimental participants interpreted

ambiguous words according to their preparatory sets, demonstrating that perceptual readiness may be created by suggestion or instruction.

The tendency to assimilate unclear or novel experience to the familiar was demonstrated by Bruner and Postman (1949) in the incongruous playing card experiment. Playing cards, including some unusual ones such as a black six of hearts were flashed on a screen by means of a tachistoscope. Incongruous color and form were ignored by 27 of 28 subjects demonstrating that familiarity with the stimulus objects influenced what the observers saw or thought they saw. What a person perceives, therefore, depends greatly on what he is ready for.

Birch and Rabinowitz (1951) demonstrated the role of set with a group of college students. Two groups of students were given training, one group with an electrical switch, the other with a relay. Both groups learned about their device and what it would do. After the training period the students were tested individually with the problem of having to tie two strings together which were suspended from the ceiling but too far apart to be reached at the same time. The solution to the problem is to tie an object to one string and swing it like a pendulum so that both strings can be brought together. The purpose of this study was to see which object, the switch or relay, they would use as the weight. Most of the students used as a weight the object they had not learned about. The prior training or set influenced their choice of objects;

if they knew the object was a switch, it was a switch not a weight. A third group of engineering students who had used both kinds of equipment acted as a control. They were equally divided in their choice of switch or relay.

If prior experience with a potential problem solving tool can affect subsequent use of that tool, it is likely that the individual's perceptual response to the visual environment is also influenced by habitual or momentary interests and sets.

Evaluating research on visual training, Sells and Fixott (1957) concluded that through appropriate conditions for learning, particular visual functions can be improved. They also say that greater perceptual learning may take place if training procedures relate specifically to the visual functions one seeks to improve. This suggests that perceptual training taught in conjunction with art activities may help the student to develop sets which will encourage him to see objectively in a flexible and exploratory manner, and to eliminate redundant visual information. Such a pattern could affect the child's drawings of visual stimuli.

Research into the psychology of perception indicates that perception is an information handling process determined in part by learning that has already occurred. Prior learning creates expectations or sets that influence what and how one perceives. When new knowledge input conflicts with prior learning, the stronger habitual learning tends to prevail. Since people handle incoming visual information differently and since these differences appear to be in a large part learned a more adequate means of handling visual information requires careful consideration as behavior which

can be taught.

Review of Educational Research Studies

Numerous cultural and psychological research studies related to visual perception have demonstrated that perceptual responses may be affected by prior experiences or training. Based on these findings Gibson (1953) concluded that particular aspects of visual perception may be improved with practice and with reinforcement of correct responses. This indicates the need for serious attention to the cultivation and training of visual sensitivity in art education programs. Such training procedures which might be presented in a school art program will require considerable research and consideration. Following are several studies which have attempted to define the specific kinds of perceptual training which might contribute to the child's visual sensitivity.

Kensler (1965) attempted to demonstrate that grade seven students' ability to utilize the perspective system in drawing would increase by giving them relevant perceptual training. No significant differences were reported between the experimental group and a second group without such training. His study did, however, raise some questions relevant to patterns of space orientation and the ability to draw perspective. He concluded that the differences in perceptual abilities students bring to the tasks of the art class may be a critical variable in the teaching of art and needs further investigation. He also says:

> In this study perceptual training was integrated with learning to draw in perspective. Providing the training to attend to the appropriate visual cues prior to teaching the system of perspective

> drawing may have produced different results. Whether changes in perception can be accomplished by brief but intense training or by continuous training over a longer period of time are questions to be answered. (p. 41)

Salome (1966) reporting on the results of a study conducted by Efland says:

> Efland found that perceptual training designed to develop the ability to discriminate oblique lines and angles significantly improved differentiation of form in the man and house drawings of first grade children from what he described as an upper middle class environment. However, lower middle class children did not respond to the treatment. He speculates that a readiness factor relevant to socio-economic background may effect a child's response to the training used in his study. (p. 28)

Basic to this research is the study conducted by Salome (1964). He sought to determine if perceptual training presented in conjunction with drawing instruction would increase the visual information content of elementary school children's drawings significantly more than participation in drawing activities without direct perceptual training. Ambiguous results were obtained from the fourth grade drawings. The fifth grade drawings, however, showed that the training aimed at getting the children to perceive visual cues located along contour lines will increase the amount of visual information they include in their drawings.

Lansing (1969) in discussing the affects of cultures and subcultures on perceptual development offers the following explanation for the results of Salome's study:

> The person who offered the training was of course, a part of the cultural environment that surrounded those fifth-grade children, and the visual cues along the contour lines were aesthetic elements.

> Thus it is clear that aesthetic form will be perceived and learned if the culture or subculture place an importance on it. (p. 127)

Salome's study relied heavily upon the research of Attneave (1954). According to Attneave, perception is an "information-handling process." Much more visual information is available than we use. Attneave has identified three major processes with which we sort out, reject or use and classify all this information. The first of these is to classify similar things as units. For example, one does not normally perceive the individual hairs on a cat, instead one perceives that the cat is furry.

The second process is to classify the random by averages. When some portion of the visual field contains a great quantity of information that varies according to a regular pattern, those components of information which do not have "redundant" representation are averaged out.

The third process is to classify according to wholes or completions. Attneave says, that through experience, the individual learns to associate certain visual stimuli. For example, if we see part of an ear exposed in a drawing we tend to envisage the rest of the face.

It is Attneave's thesis that a major function of the perceptual process is to do away with some of the redundancy of visual stimulation and describe incoming information as economically as possible. Based upon his research Attneave concluded that:

1. Visual information is concentrated along contours, especially at points of contour direction change, angles and peaks of curvature, and at points of

abrupt color change.

2. The problem of visual redundancy which may result from areas of homogeneous color, texture, or contour direction (as in the case of stair-steps) may be coped with by referring to contours and boundaries for information which will aid in defining shape.
3. Individuals can select contour points of greatest information content, thus increasing their capacity to handle visual information.
4. Drawing which is essentially a linear operation, might be preceded with perceptual training which encourages the individual to refer to contours and boundaries for essential bits of information prior to delineating visual symbols.

If visual information is concentrated along contours, and if redundant visual stimulation results from areas of homogeneous color, texture, and contour direction; the child might benefit from training to look for the differences between essential cues and redundant information. Developing the child's ability to see and deal with visual detail in a selective manner would therefore seem to be a task well suited for school art education programs.

The educational research suggests that since visual perception is to a large extent learned, a more adequate means of handling visual information can be taught. A critical variable in the teaching of art may be to teach for perceptual development in

terms of what the children already know. Helping children to focus only on certain aspects of incoming visual stimuli and rejecting redundant visual information may cause the child to perceive more accurately. These kinds of visual training experiences might make the art education program more meaningful for the children and consequently cause them to learn more.

Conclusion

Cultural studies indicate that the development of visual perception is affected by the culture and subcultures in which one lives. Cultural experiences and values affect the development of perception by providing an informal kind of perceptual training which influences the way individuals utilize information in their drawings. The psychological research into perceptual development clearly indicates that individuals tend to handle new information in terms of learning which has already occurred. Prior learning creates expectations or sets that influence how and what individuals perceive. Educational research studies indicate that specific kinds of perceptual training might contribute to the development of a child's visual perception. These studies are few and limited however, thus indicating the need for further research in this area.

The available anthropological evidence and experiments in the psychology of perception indicate that learning definitely enters into the determination of perception. There are many questions concerning exactly where and when this happens during the child's learning experiences that remain unanswered. A

pertinent problem for art educators, however, is defining ways their field may contribute to and include perceptual training as part of the child's art experiences. This study will attempt to determine if perceptual training presented to grade one children will increase the visual information content of their drawings significantly more than participation in drawing activities without direct perceptual training. The next chapter will outline the procedures followed.

CHAPTER III

RESEARCH DESIGN

Assuming that art experiences are concerned with developing visual observation and judgement it would appear that investigations of perceptual training should be carried out in the school art program. This is not a new notion or goal of art education, but, perhaps, one that should be receiving more emphasis if perceptual growth is to continue as an aim of art education.

Steps, therefore, should be taken to ascertain whether or not learning strategies will take children beyond the skills vicariously acquired through the cultural and physical environment and to what degree they can be developed and presented as part of the art program. The extent to which participation in a particular kind of art activity may affect visual perception remains open to question. The preceding chapter, however, furnished the basis for hypothesizing that:

1. The development of visual perception is affected by the culture and subcultures in which one lives.
2. Individuals tend to handle new information in terms of learning which has already occurred.
3. If specific perceptual training tasks are defined and taught in conjunction with art activities the development of a child's visual perception might be enhanced.

The Experimental Hypothesis

Salome's research on the effects of perceptual training upon the two-dimensional drawings of children, and Attneave's theory of contour information provided the basis for the major experimental hypothesis, the object of this study. This study attempted to determine if a specific kind of perceptual training will increase the visual information content of grade one children's drawings significantly more than participation in drawing activities without directed perceptual training. The major directional hypothesis which guided this study is; perceptual training which encourages the child to look for information concentrated along contours of objects or patterns, at points of contour direction change, such as angles, peaks of curvature, and at lines caused by abrupt color changes, will increase the amount of visual information a grade one child includes in his drawings.

Arising from the major hypothesis were seven questions which were converted into the following specific hypotheses which underly this study.[1]

Hypothesis I There will be a significant difference between experimental and control groups when pre-test scores are held constant on:

(1) total post-test scores;
(2) communicative symbol, post-test:
(3) closure-clarity, post-test; and proportion post-test.

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[1] It is assumed in stating the hypotheses that higher scores will be in favor of the treatment groups.

Hypothesis II There will be a significant difference between experimental and control groups when intelligence (I.Q.) scores are held constant on:

(1) total post-test scores;

(2) communicative symbol, post-test;

(3) closure-clarity, post-test; and

(4) proportion, post-test.

Hypothesis III For the experimental group there will be a significant difference between pre-test and post-test scores on:

(1) total post-test scores;

(2) communicative symbol, post-test;

(3) closure-clarity, post-test; and

(4) proportion, post-test.

Hypothesis IV For the control group there will be no significant difference between pre-test and post-test scores on:

(1) total post-test scores;

(2) communicative symbol, post-test;

(3) closure-clarity, post-test; and

(4) proportion, post-test.

Hypothesis V When pre-test scores are held constant there will be no significant difference between male and females in the experimental group on:

(1) total post-test scores;

(2) communicative symbol, post-test;

(3) closure-clarity, post-test; and

(4) proportion, post-test.

Hypothesis VI There will be a significant difference between experimental and control groups in the amount of visual information contained in drawings of a trial object on:

(1) total post-test scores;

(2) communicative symbol, post-test;

(3) closure-clarity, post-test; and

(4) proportion post-test.

Hypothesis VII There will be a significant difference between experimental and control groups in the amount of visual information contained in drawings of an unfamiliar object on:

(1) total post-test scores;

(2) communicative symbol, post-test;

(3) closure-clarity, post-test; and

(4) proportion, post-test.

The Pilot Study

Two grade one classes at Dovercourt School in Edmonton, Alberta were selected in which to pre-test the teaching devices, instructional procedures, suitability of stimulus objects, and rating scale. With a coin toss one class was designated as the control group and the other the experimental group.

Two test lessons and a series of five sequential demonstration tasks were presented by the researcher to each grade one class over a four-week period. During this time the students were required to draw a drum and mounted bird for the test lessons, and a wagon, boat, television set, ukulele, and wheelbarrow for the sequential demonstration tasks.[2] The test objects, drum and bird, were presented before and after the period of treatment. All instruction and data collection was done by the researcher. Students were omitted if they missed more than one of the lessons.

Upon evaluation of the pilot study it was decided that one of the stimulus objects (the portable television set) would not be used in the study. The researcher noted that many of the students drew the television with a picture on the screen even though it did not have one--the television set was not "on." It was felt that the desire, by some students, to include an image on the screen of the television diverted some of the task orientation away from producing a drawing of the stimulus object before them. To avoid the possibility of this distraction affecting the effectiveness of perceptual training in the study the television was replaced by a toy dog as the stimulus object.

A question that arose upon completion of the pilot study was: "If a child can be trained to increase the visual information content of a drawing after receiving perceptual training, will this knowledge transfer to an unfamiliar object?" To answer this question

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[2] See Appendix 1 for test items and stimulus objects used.

it was decided that a non-objective sculpture would be added as a test item in the study.

The drawings obtained from the pilot study were used to refine the rating scale. The 15 point rating scale consisted of Salome's three criterion categories; (1) communicative symbol, (2) closure-clarity, and (3) proportion which were the dependent variables of the study.

Population of the Study

It was decided that the experimental group and control groups would be chosen from one school. Forest Heights School of the Edmonton Public School System was selected for the research because it contained two heterogeneously grouped grade one classes that received art instruction from the same teacher. It was believed that with this sample, the socio-economic backgrounds of the two groups would be essentially the same and the effect of prior training on drawing ability would be minimized.

A toss of a coin was used to determine the experimental and control groups. The experimental group had an enrollment of 29 and the control group had an enrollment of 28. A child was eliminated from the study if he missed any one of the tests or demonstration lessons. As a result there were 25 experimental subjects and 24 control subjects for final analysis.

Time Periods

Both experimental and control groups were given test and demonstration lessons over a four week period. All instruction was

conducted during the regular scheduled time period for art. This was from 1:30-2:00 p.m. and from 2:00-2:30 p.m. each Wednesday and Friday for the experimental and control groups respectively. Five minutes at the beginning of each time allotment was reserved for organization, thus making the instructional time 25 minutes.

Dependent Variables

All drawings were analyzed in terms of the following variables:

1. Communicative Symbol: This variable is concerned with how the drawing communicates the characteristics of the stimulus object through accurate location of and differentiation betweem maximal information points found at; (1) angles, (2) peaks of curvature, and (3) lines caused by abrupt color or texture change.
2. Closure Clarity: This variable is concerned with how well a sense of organization is achieved through the closure of line which remains sensitive to characteristic linear movement found in the contour of the form. The form and component parts are enclosed by line which describes straight and curved edges relevant to the shape of the parts in the object.
3. Proportion: This variable is concerned with height, width, and size relationships of parts to the whole.

Types of Treatment

A pre-test was administered on the first day followed by five sequential drawing tasks on each subsequent day. A post-test was

administered on the seventh day. Students were required to draw an unfamiliar object on the eighth and final day of the study.

To avoid variances in instructional procedures for the pre and post-drawing periods, a prepared dialogue was adhered to for both groups. (See Appendix 2). For the five instructional drawing tasks, all known instructional materials were held constant, for both experimental and control groups, and only the independent variable, perceptual training was varied. The instruction for the eighth drawing task was limited to a discussion about the stimulus object--its parts, and its use, but no perceptual training exercises were included.

Materials and Media

Crayons and 12 by 18 manila paper were used for all drawings by both groups. Crayons were selected as the drawing tool because of the relative ease with which they can be manipulated by grade one students and because they were familiar with this drawing medium. The size of paper was selected on the basis that it would allow sufficient space for the students to include adequate detail in their drawings while still being easily manageable.

Stimulus and Test Objects

The test objects and the objects used in the sequential demonstration tasks were selected on the basis that:

1. The major form and component parts of each object could be defined by lines.

2. The objects provided different drawing problems i.e. some had a majority of straight lines while others consisted of predominantly curved lines.
3. Each object included three kinds of visual cues relevant to Attneave's theory of contour information. (see below: dependent variables).
4. The objects were considered to have few enough component parts so as to make the drawing task not too difficult and to have enough component parts to differentiate between abilities to include the information.[3]

Experimental Group Instruction

A pre and post-test was administered on the first and seventh day of the experiment. The five experimental group instructional lessons included demonstration-participation exercises in defining and referring to contour lines and locating points of maximal information concentrated along such lines. The eighth lesson included a discussion about the stimulus object, but no direct reference was made about the contour lines and points of maximal information.

Both two and three dimensional teaching devices, were used during these lessons. During the test and instructional lessons the students were encouraged to examine the objects and their component

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[3] See Appendix 1 for a description of the stimulus and test objects.

parts prior to drawing them. Throughout the five instructional lessons it was emphasized that: (1) contour lines describe the boundaries of objects and their component parts; and (2) contour lines included points of information which if properly located and connected with line can be used to produce representational drawings.

Purpose of each task. Following is a brief description of the major purpose of each instructional lesson.

1. The major purpose of the first instructional lesson was to establish a definition of the term contour.
2. The second instructional lesson emphasized that points of maximal information in contour drawings are found where there are angle changes.
3. The major purpose of the third lesson was to emphasize that maximal points of information are found at angles and to further establish that peaks of curvature also provide points of maximal information.
4. Lesson four emphasized that lines are caused where there are sudden color changes.
5. The prime purpose of lesson five was to provide the students with practise in recognizing contours and points of maximal information.

The perceptual training instructional procedures included such devices as presenting contour lines through black line drawings and silhouettes on overlapping sheets of acetate which were produced

on a screen by an overhead projector. Points of maximal information were indicated by arrows on the silhouettes. In other instances students were presented with black line drawings and tracing paper on which they could trace around the contour of the object. A list of experimental group lessons is shown in Appendix 2.

Control Group Instruction

The control group was required to draw the same stimulus objects as the experimental group. The control group, however, was given controlled drawing instruction.[4]

No visual aids or instruction pertaining to contour lines or points of information were included in these lessons. Each instructional period was carefully planned to provide the students with incentive to draw the objects. The teaching included crayon technique and consisted of discussions of the item's characteristics such as shape, texture, color, proportion and component parts. The purpose or use of the object was also discussed. During the drawing period group instruction and individual assistance were provided, as well as verbal encouragement. Questions were answered pertaining to the nature of the object when requested. A list of control group lessons is shown in Appendix 2.

Drawings for Evaluation

Both experimental and control groups were rated on the

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[4] Refer to definitions in Chapter 1 for explanation of controlled drawing instruction.

following drawings:

1. two pre and post-experimental drawing tasks;
2. a trial drawing task from lesson six which tested for between group variances:
3. the drawing task from lesson eight which was to determine if there was a transfer of knowledge to an unfamiliar object.

Rating Procedures

All drawings were rated by four independent judges. The judges included two members of the art education staff of the University of Alberta and two art education graduate students of which one was the researcher.

Prior to the judging of the drawings, several training sessions were conducted for the judges by the researcher. The training sessions were arranged to ensure that all judges were completely familiar with the rating procedures, and to develop common standards by which to rate the students' drawings.

Each judge was given a printed statement of general information. (See Appendix 3). The statement included a description of the purpose of the research project; definitions of the three criteria used to analyze the drawings; and a series of guidelines to be used when scoring the students' drawings. The guidelines are as follows:

1. Read the criteria literally; avoid aesthetic evaluations which do not pertain to the scale.
2. Do not attempt to rate what is not shown in the drawing.

3. If the bottom edge of the paper is used as a base line give credit. Don't confuse this with running an over-sized shape off the paper.
4. The subjects were asked to draw only a side view of the stimulus objects. Don't subtract or add to the drawing score for parts in excess of a two-dimensional view.
5. The subjects are not expected to make ruler straight lines or compass round circles. They should be able to indicate both.
6. Credit is given for locating line caused by color change if a child fills in with solid color rather than using two lines.
7. A drawing may have points on one side but not the other. Give credit for those included if correctly located.
8. If the child has been ambiguous about differentiating between angles and curves, the scale provides for this.
9. The subjects were not asked to replicate the colors of the stimulus objects. Color usage is therefore irrelevant when scoring.
10. When in doubt about a score, assign the lower number.

Directions for scoring the drawings were included on the rating scale. (See Appendix 4). The 15 point rating scale listed the three criteria upon which all drawings were scored: (1) communicative symbol, (2) closure-clarity, and (3) proportion. Each criterion was followed

by five descriptive statements indicating the degree to which a drawing may have achieved that measure. For each drawing, judges were instructed to circle the number on their scoring sheet which corresponded to the number on the rating scale by the one statement which best described the drawing with respect to the particular criterion. This procedure was to be followed for each drawing and for all three criteria. To provide greater assurance that increase over very low strating scores might be due to the experimental treatment, a score of one would be the lowest rating assigned any drawing on each of the three criteria for use in the study.

In order that judges could identify where peaks of curvature, angles, and lines caused by color change occurred; the researcher prepared drawings of each test item showing the location and differentiation of contour information points. (See Appendix 4). These drawings were also used by the judges as the comparative basis upon which to rate the students' drawings on closure-clarity and proportion.

In conjunction with each drawing showing the location and differentiation of contour information points, judges were given a sheet containing information for scoring that particular drawing. These information sheets contained precise direction for scoring the test item they refer to. (See Appendix 4).

The last training session included scoring a sample of drawings from the pilot project. The reliability coefficients between ratings supplied by the independent judges and between criteria were considered high enough to continue with scoring the drawings from the study.

From the study each judge scored:

1. 25 pre-experimental group drum drawings
2. 25 pre-experimental group bird drawings
3. 24 pre-control group drum drawings
4. 24 pre-control bird drawings
5. 25 experimental group wheelbarrow drawings
6. 24 control group wheelbarrow drawings
7. 25 post-experimental group drum drawings
8. 25 post-experimental group bird drawings
9. 24 post-control group drum drawings
10. 24 post-control bird drawings
11. 25 experimental group sculpture drawings
12. 24 control group sculpture drawings

Collection and Identification of Drawings

Students in both experimental and control groups were asked to place their first and last name on the back of each of their drawings at the end of the instruction period. The drawings were then collected by the researcher and placed in manilla folders to be coded. The researcher placed the identifying code in the upper right hand corner of each drawing to be scored. Following the placement of the identification code the drawings were placed in four groups representing the four stimulus objects. The drawings within each pile were then mixed enabling judges to identify the drawings only by the code.

Scoring Sheets

The scoring sheets included space for identification of the drawing being scored and a space for judge identification. (See Appendix 5). The sheet consisted of three criterion categories; (1) communicative symbol, (2) closure-clarity, and (3) proportion. Each of the three criteria was then followed by the numbers one through five indicating the degree to which a drawing may have achieved that criterion. The scorer circled one number which best described the drawing with respect to the particular criterion. A total score was then determined for each drawing. The researcher transcribed the scores from the scoring sheets onto a master sheet and calculated a mean score for analysis. See Appendix 6 for scores obtained by each student on all test drawings.

Statistical Procedures

Computational procedures for analysis of data used in this study have been programmed for use with the University of Alberta's computer. Programs were made available to the investigator by personnel of the Division of Educational Research Services, Faculty of Education. Accordingly, statistical analyses were handled by the I.B.M. 360 computer with the use of suitable programs in fortran language at the University of Alberta. The tests used and the results of the analyses are presented in the following chapter.

CHAPTER IV

FINDINGS AND DISCUSSION

This chapter presents the findings resulting from the statistical analysis of inter-judge reliability and the hypotheses underlying this study. An analysis of treatment effect on low, medium and high I.Q. groups is also shown.

Coefficients of Inter-Judge Reliabilities

To determine the level of agreement between judges, inter-judge reliability coefficients were computed. The obtained reliability coefficients amongst the four judges are presented in Table 1. The reliabilities for inter-rater agreement over all drawings fell between .70 and .95 with a mean of .89. This indicates a high level of agreement amongst judges in using the instrument to measure drawings in terms of the experimental criteria; communicative symbol, closure-clarity, and proportion.

TABLE 1

RELIABILITY COEFFICIENTS ON ALL TEST DRAWINGS

Criterion	Drawing	Reliability Coefficients
Communicative symbol	Drum (pre-test)	.91
closure-clarity		.92
proportion		.70
Communicative symbol	Bird (pre-test)	.87
closure-clarity		.91
proportion		.89
Communicative symbol	Wheelbarrow	.94
closure-clarity		.88
proportion		.89
Communicative symbol	Sculpture	.95
closure-clarity		.93
proportion		.93
Communicative symbol	Drum (post-test)	.89
closure-clarity		.89
proportion		.85
Communicative symbol	Bird (post-test)	.90
closure-clarity		.91
proportion		.90

Analysis of Drawing Scores

All test drawings were analyzed in terms of the hypotheses that follow. For the purposes of statistical analysis, all hypotheses were restated in the null form.

Hypothesis I. There will be a significant difference between experimental and control groups when pre-test scores are held constant on:

(1) total post-test scores

(2) communicative symbol, post-test

(3) closure-clarity, post-test, and

(4) proportion, post-test.

No significant differences were obtained from the analysis of covariance between treatment groups with pre-test scores held constant. (See Table 2). Thus treatment appeared to have no significant effect upon the outcome of post-test scores for either drum or bird drawings with pre-test scores held constant. Hypothesis I was therefore rejected. It is noted, however, that the F ratios for the proportion criterion on bird drawings approached the .05 level of significance. This indicates that treatment may have had some effect on improving the child's ability to delineate the bird drawings with respect to proportion.

Hypothesis II. There will be a significant difference between experimental and control groups when intelligence (I.Q.) scores are held constant on:

(1) total post-test scores

(2) communicative symbol, post-test

(3) closure-clarity, post-test, and

(4) proportion, post-test

TABLE 2

COMPARISON OF TREATMENT GROUPS WITH POST-TEST SCORES AS CRITERION AND PRE-TEST SCORES AS COVARIATE

Criterion Categories	R^2 Full	R^2 Rest	Degrees Freedom	F Ratios	P
Drum					
Communicative symbol	.2712	.2711	1,46	.003	.95
closure-clarity	.2322	.2294	1,46	.171	.68
Proportion	.3591	.3588	1,46	.017	.90
Total	.3867	.3865	1,46	.015	.90
Bird					
Communicative symbol	.0222	.0221	1,46	.002	.97
closure-clarity	.2077	.1787	1,46	1.680	.20
Proportion	.2082	.1591	1,46	2.843	.10
Total	.1644	.1433	1,46	1.162	.29

No significant differences were obtained for the analysis of covariance between treatment groups with I.Q. estimates held constant. (See Table 3). Thus treatment appeared to have no significant effect upon the outcome of post-test scores for either drum or bird drawings with I.Q. estimates held constant. Hypothesis II was therefore rejected. The analysis did disclose, however, that the F ratio for the proportion criterion for the bird drawings approached the .05 level of significance. Similar findings were also noted in the analysis of testing Hypothesis I. This indicates that treatment may have had some effect

on improving the child's ability to delineate the bird in terms of proportion.

TABLE 3

COMPARISON OF TREATMENT GROUPS WITH POST-TEST SCORES AS CRITERION AND I.Q. ESTIMATES AS COVARIATE

Criterion Categories	R^2 Full	R^2 Rest	Degrees Freedom	F Ratios	P
Drum					
Communicative symbol	.0353	.0277	1,46	.363	.55
closure-clarity	.2021	.1589	1,46	2.493	.12
Proportion	.1029	.0809	1,46	1.130	.29
Total	.1159	.0911	1,46	1.293	.26
Bird					
Communicative symbol	.1779	.1779	1,46	.001	.98
closure-clarity	.1494	.1105	1,46	2.100	.15
Proportion	.1237	.0705	1,46	2.798	.10
Total	.1654	.1395	1,46	1.433	.23

Hypothesis III. For the experimental group there will be a significant difference in pre and post-test scores on:

(1) total scores

(2) communicative symbol

(3) closure-clarity, and

(4) proportion.

The t-test comparing the difference between pre-mean and post-mean scores reveals that there were no significant differences. (See Table 4). It may therefore be concluded that perceptual training had no significant effect on the amount of visual information the experimental group included in post drum and bird drawings. It is noted however, that the greatest gain in post-mean scores over pre-mean scores was on the proportion criterion for bird drawings. These results are in accord with the analysis of testing hypothesis I and II; that treatment may have had some effect on improving the child's ability to delineate the bird in terms of proportion.

TABLE 4

COMPARISON OF PRE AND POST-t-SCORES
FOR EXPERIMENTAL GROUP

Variable	Pre-Mean	Post-Mean	t	P
Drum Drawings				
Communicative symbol	1.84	2.00	.85	.41
closure-clarity	2.24	2.28	.21	.83
Proportion	2.12	2.20	.53	.60
Total	6.20	6.48	.66	.52
Bird Drawings				
Communicative symbol	2.00	2.04	.23	.82
closure-clarity	2.24	2.24	.00	1.00
Proportion	2.00	2.24	1.37	.19
Total	6.24	6.52	.60	.56

Hypothesis IV. For the control group there will be no significant differences in pre and post-test scores on:

(1) total scores

(2) communicative symbol

(3) closure-clarity, and

(4) proportion.

The t-test comparing the differences between pre and post-test scores shows that there were no significant differences between pre-mean and post-mean scores. (See Table 5). Thus hypothesis IV was accepted. It may therefore be concluded that the controlled instruction had no significant effect on the amount of visual information the control group included in post-test drum and bird drawings. It appeared however, that the control group gained on total post-mean scores for the drum drawings while total post-mean scores for the bird drawings were lower than pre-mean scores. This suggests that variables other than those accounted for affected the amount of visual information the students contained in their drawings. The control group had no imposed method of perceiving stimulus objects so that the operating variable may have been one of familiarity. Due to prior learning it is likely that the students had expectations or sets that influenced how they perceived the bird. When required to draw the bird for the second time it is possible that the students relied more on memory than on perceptions, thus resulting in lower post-test scores. On the other hand lack of familiarity with drums, and especially the type used in the study may have contributed to the suggestion of growth on post-

test drum drawings. Since the drum was not a familiar object students had not built up expectations or sets and were therefore obligated to look at the object during the drawing process. As a result the students' second drum drawing showed growth.

TABLE 5

COMPARISON OF PRE AND POST-t-SCORES
FOR CONTROL GROUP

Drum Drawings				
Variable	Pre-Mean	Post-Mean	t	P
Communicative symbol	1.58	1.83	1.66	.11
closure-clarity	1.71	1.92	1.31	.20
Proportion	1.79	1.96	1.28	.21
Total	5.08	5.71	1.67	.11
Bird Drawings				
Communicative symbol	1.96	2.04	.49	.63
closure-clarity	2.13	1.96	.94	.36
Proportion	1.96	1.92	2.56	.77
Total	6.04	5.92	12.17	.76

The analyses thus far have not significantly shown that perceptual training relevant to representational drawing increases the amount of visual information grade one children include in their drawings of visual stimuli. Although not statistically significant, it does appear that the experimental group increased in their ability to draw the bird in terms of proportion. The first two tests which

compared the two groups on post-test scores indicated that there were differences between the experimental and control group on the proportion criteria for bird drawings. The third test comparing pre-test scores with post-test scores for the experimental group indicated that mean post-test scores for the proportion criterion on bird drawings were higher than mean pre-test scores. This same analysis conducted with the control group indicated no gain in post-mean scores over pre-mean scores for the proportion criterion on bird drawings. This suggests that the perceptual training may have increased the experimental group's ability to render the bird drawing in terms of proportion.

Hypothesis V. When pre-test scores are held constant there will be no significant difference between males and females in the experimental group on:

(1) total post-test scores

(2) communicative symbol, post-test

(3) closure-clarity, post-test, and

(4) proportion, post-test.

No significant F ratios were obtained for the analysis of covariance between male and female scores in the experimental group with pre-test scores held constant. (See Table 6). Sex appeared to have no significant effect on the amount of visual information included in post-test drawings.

TABLE 6

COMPARISON OF SCORES BETWEEN MALES AND FEMALES
WITH POST-TEST SCORES AS CRITERION AND
PPE-TEST SCORES AS COVARIATE

Criterion CAtegories	R^2 Full	R^2 Rest	Degrees Freedom	F Ratios	P
Drum					
Communicative Symbol	.2752	.2711	1,46	.259	.61
closure-clarity	.2521	.2294	1,46	1.396	.24
Proportion	.3686	.3588	1,46	.711	.40
Total	.3900	.3865	1,46	.256	.62
Bird					
Communicative Symbol	.0547	.0221	1,46	1.583	.21
closure-clarity	.1819	.1787	1,46	.179	.67
Proportion	.1617	.1591	1,46	.139	.71
Total	.1528	.1433	1,46	.515	.48

Hypothesis VI. There will be a significant difference between experimental and control groups in the amount of visual information contained in drawings of a trial object (wheelbarrow) on:

(1) total scores

(2) communicative symbol

(3) closure-clarity, and

(4) proportion.

The wheelbarrow used as the stimulus object in the sixth instructional lessons was selected as the trial object. The drawings obtained from this lesson were scored in order to estimate the effect of treatment upon drawings of forms other than the pre and post-test objects.

The one-way analysis of variance of the wheelbarrow drawings indicates that a highly significant difference existed between experimental and control groups on all criteria. (See Table 7). The probabilities for accepting hypothesis VI exceeds the .01 level of significance. It may therefore be concluded that the perceptual training offered the experimental group had an immediate effect upon their ability to delineate the wheelbarrow in terms of the three criterion categories (communicative symbol, closure-clarity and proportion).

TABLE 7

ONE-WAY ANALYSES OF VARIANCE BETWEEN EXPERIMENTAL AND CONTROL GROUPS ON WHEELBARROW DRAWINGS

Criterion Categories	R^2 Full	R^2 Rest	Degrees Freedom	F Ratios	P*
Communicative symbol	.3201	0	1,47	22.131	.00002
closure-clarity	.3743	0	1,47	28.110	.00000
Proportion	.2252	0	1,47	13.665	.00057
Total	.3314	0	1,47	25.458	.00001

* All probabilities exceed the .01 level of significance.

TABLE 8

ONE-WAY ANALYSES OF VARIANCE BETWEEN EXPERIMENTAL AND CONTROL GROUPS ON SCULPTURE DRAWINGS

Criterion Categories	R^2 Full	R^2 Rest.	Degrees Freedom	F Ratios	P*
Communicative symbol	.3939	0	1,47	30.542	.00000
closure-clarity	.2893	0	1,47	19.134	.00007
Proportion	.2269	0	1,47	13.792	.00054
Total	.3450	0	1,47	24.754	.00001

* All probabilities exceed the .01 level of significance

Hypothesis VII. There will be a significant difference between experimental and control groups in the amount of visual information contained in drawings of an unfamiliar object (sculpture on:

(1) total scores

(2) communicative symbol

(3) closure-clarity, and

(4) proportion

The results of the analysis showed that there were highly significant differences between the experimental and control groups on all three criteria. (See Table 8). The probabilities for accepting hypothesis VII exceeded the .01 level of significance. It may be concluded, therefore, that perceptual learning occurred in favor of the experimental group as a result of prior treatment, and

that this knowledge was transferred to the task of drawing an unfamiliar object.

Upon completion of testing the hypotheses, a two-way analysis of variance was conducted to determine the effects of treatment of I.Q. groups. On the basis of I.Q. estimates obtained from school records, students were categorized into low, medium and high I.Q. groups.[1] Students with I.Q. scores less than 96 were categorized as the low groups, those with I.Q. scores between 96 and 120 were the medium I.Q. group, and students with I.Q. scores over 120 were categorized into the high I.Q. group. As a result of classification the experimental group contained six low, fifteen medium and four high I.Q. students. The control group contained six low, sixteen medium and two high I.Q. students.

The results of the analysis showed that treatment did not favor any one I.Q. group on drum and sculpture drawings. Perceptual training did, however, appear to have a greater effect on the high experimental I.Q. group's ability to render the bird and wheelbarrow drawings than the low and medium I.Q. groups. However, it is noted that these results are based on very small high I.Q. groups. (See Figures 1, 2, 3).

Figure 1 shows graphically the mean criterion scores obtained for low, medium and high I.Q. groups on pre-test bird drawings. Figure 2

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[1] The Detroit Beginner's Test was used to determine I.Q. scores.

shows graphically the mean criterion scores obtained for low, medium and high I.Q. groups on post-test bird drawings. Relative to pre-test scores the experimental high I.Q. group improved on post-test scores.

Figure 3 shows graphically the mean criterion scores obtained for low, medium and high I.Q. groups on wheelbarrow drawings. This figure indicates that the experimental group had higher mean scores than the control group for all three I.Q. levels. However, the mean high I.Q. group scores showed the greatest difference between experimental and control groups.

These results may suggest that the perceptual development treatment favored the high I.Q. group. In view of the fact that there were only two control group high I.Q. students and four experimental high I.Q. group students the results may have been due to variables other than I.Q., and the results may have been due to chance.

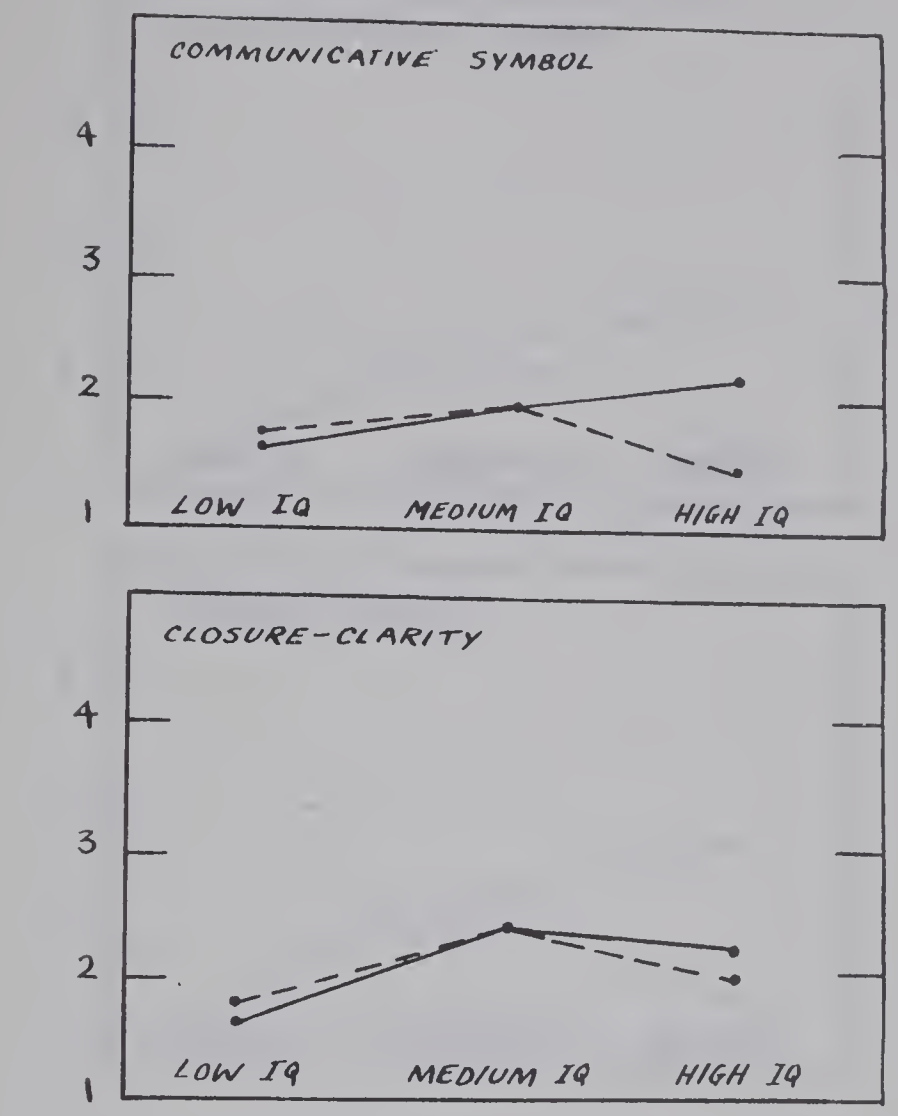
Summary of Findings

The results of the analyses led to the following conclusions:

1. There was no significant difference in the amount of visual information contained in post-test drawings between experimental and control groups.
2. There was no significant difference in the amount of visual information contained in pre-test and post-test scores for either experimental or control groups.

3. Sex had no apparent effect on the amount of visual information the experimental group contained in post-test drawings.
4. There was a significant difference between the experimental and control groups in the amount of visual information contained in drawings of a trial and unfamiliar object.
5. Investigation of treatment effect on I.Q. groups indicated that perceptual training may have had more effect on the high I.Q. group than the low or medium I.Q. groups. These findings, however, were based on a very small sample.

The results of the analysis are mixed. Post-test scores indicate that treatment had no significant effect on the amount of visual information contained in drawings, while there was a significant difference between the experimental and control groups on the amount of visual information contained in drawings of a trial and unfamiliar object. It also appeared that treatment may have affected the experimental group's ability to more accurately describe the bird drawings with respect to proportion. Further discussion and implications will be found in the final chapter. In addition, a summary of the study, conclusions of the findings and some recommendations for further research will be contained in Chapter 5.



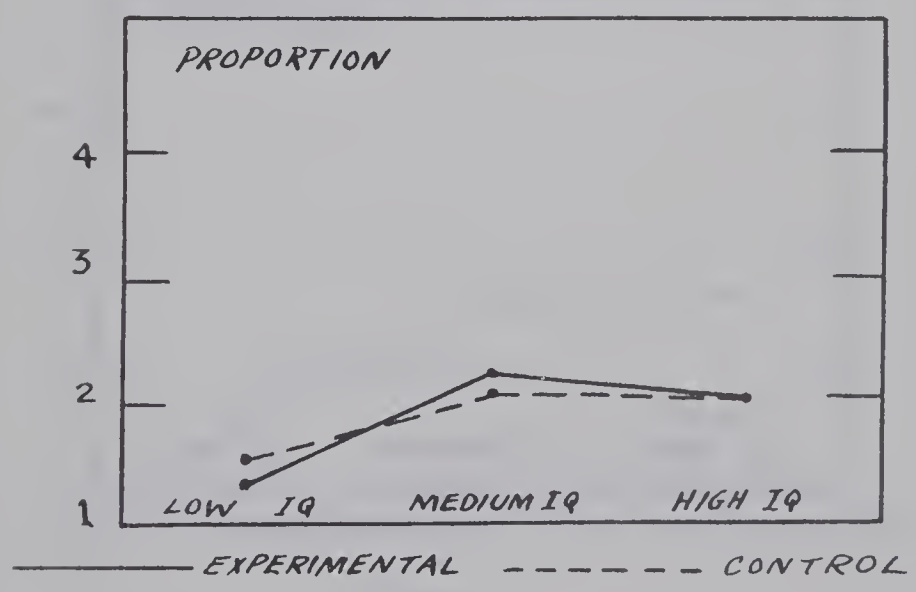
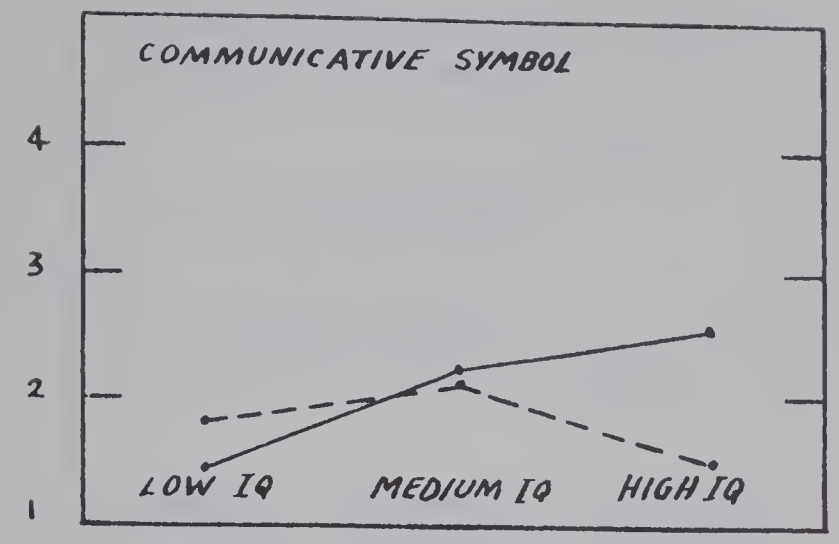
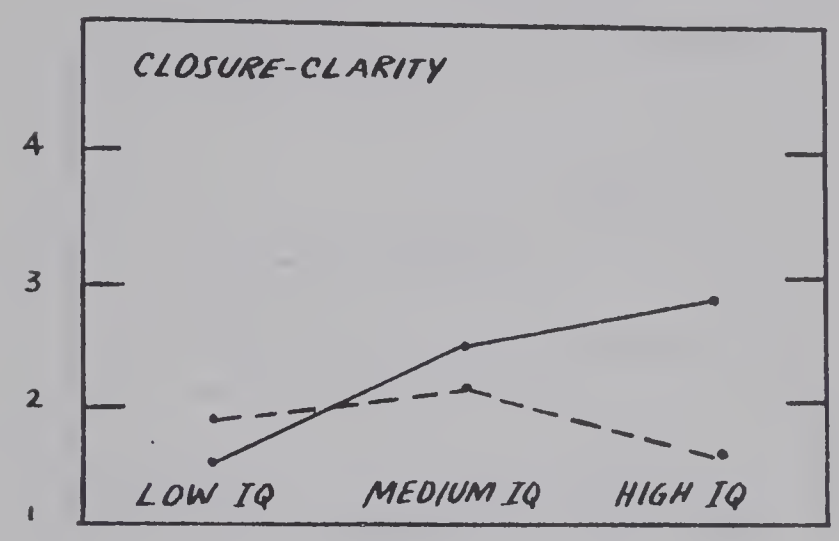


Figure 1

MEAN SCORES FOR I.Q. GROUPS ON
PRE-TEST BIRD DRAWINGS





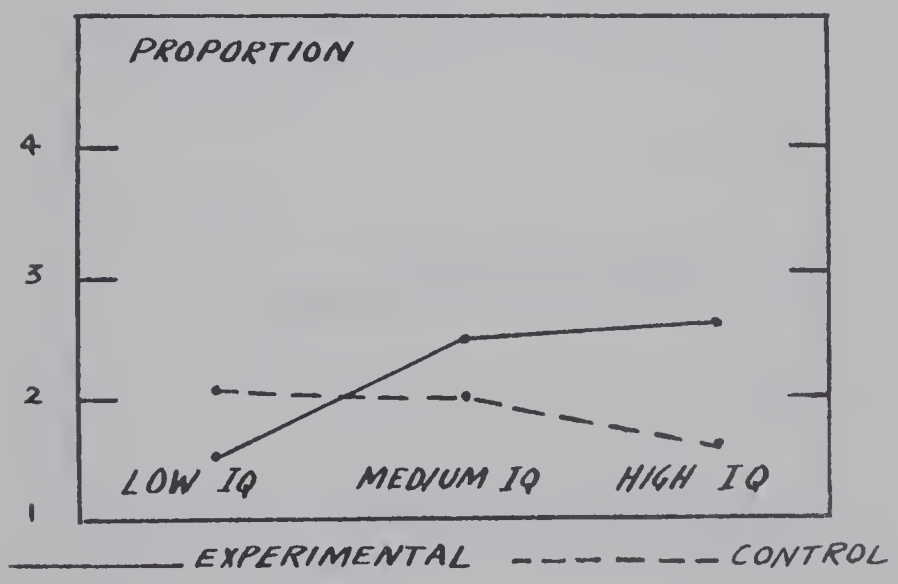


Figure 2

MEAN SCORES FOR I.Q. GROUPS ON
POST--TEST BIRD DRAWINGS

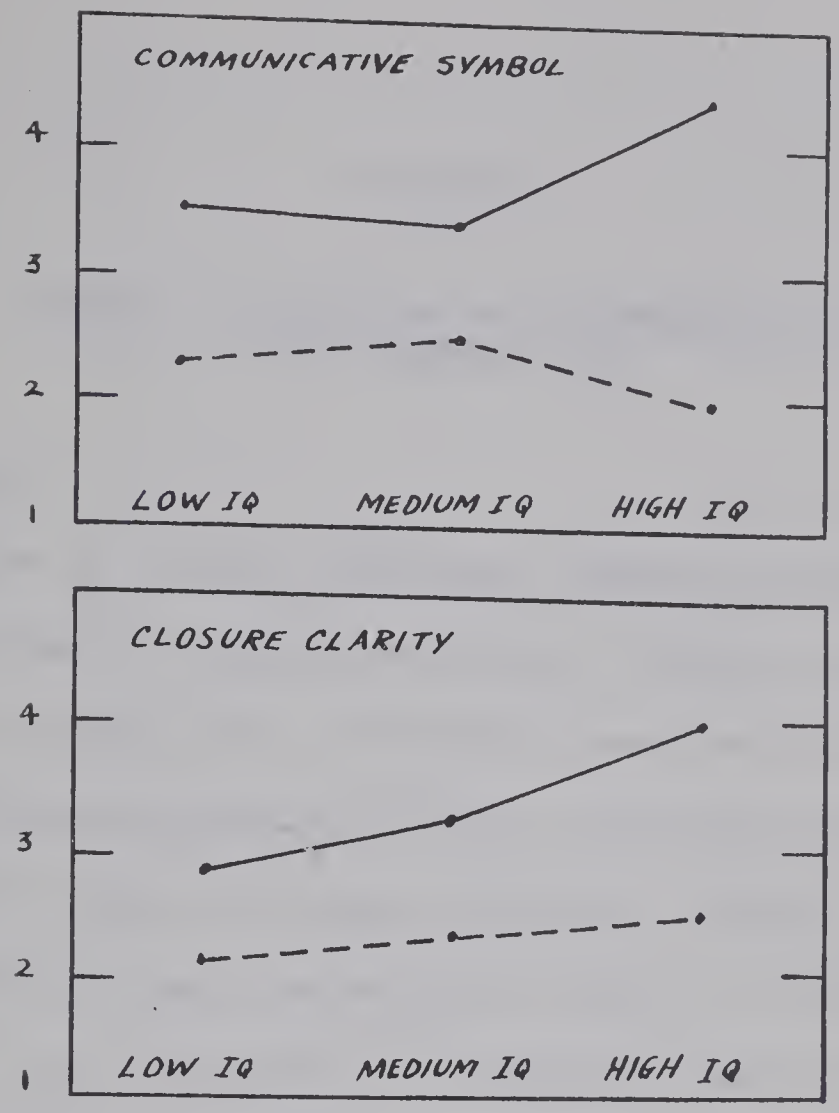


Figure 3

MEAN SCORES FOR I.Q. GROUPS ON
WHEELBARROW DRAWINGS

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER STUDY

Importance

One of the most persistent claims of art education has been the development of visual perception. Writings in art education however generally fail to describe or mention the kinds of perceptual learning experiences which may contribute to the development of specific aspects of visual perception. Rather than expect the development of visual perception to occur as a by-product of participation in art activities, art educators need to explore and evaluate under controlled experimental conditions, ways in which perceptual training can be included as part of the individual's art experiences.

Theoretical Dimensions

Cultural and educational research studies and implications from the psychology of perception led to several assumptions upon which the experimental theory was based.

1. Perceptual development may be influenced by habitual or momentary sets which evolve out of past experience or preparation to perceive.
2. Attneave (1954) concluded that perception as an information handling process must deal with much redundant material resulting from areas of homogeneous color, texture and contour directions. The problem of visual

redundancy may be coped with by learning to refer to points of maximal contour information.

3. Representational drawing involves selecting and responding to visual cues located along contours of objects.
4. Particular aspects of visual perception may be improved through instruction directed at selecting and responding to visual cues located along contours of objects.
5. If perceptual training significantly increases the amount of visual information perceived, it can be recorded in the drawing process.

Delimitations of the Study

This study sought to determine if perceptual training, which encourages the first grade child to look for information concentrated along contours of objects or patterns, at points of contour direction change such as angles and peaks of curvature, and at lines caused by abrupt color changes, will increase the amount of visual information the child includes in his drawings. In order to test this directional hypothesis the following hypotheses were proposed:

Hypothesis I. There will be a significant difference between experimental and control groups when pre-test scores are held constant on:

(1) total post-test scores

(2) communicative symbol: post-test

(3) closure-clarity: post-test, and

(4) proportion: post-test.

Hypothesis II. There will be a significant difference between experimental and control groups when intelligence (I.Q.) scores are held constant on:

(1) total post-test scores

(2) communicative symbol: post-test

(3) closure-clarity: post-test, and

(4) proportion: post-test.

Hypothesis III. For the experimental group there will be a significant difference in pre and post-test scores on:

(1) total scores

(2) communicative symbol

(3) closure-clarity, and

(4) proportion.

Hypothesis IV. For the control group there will be no significant differences in pre and post-test scores on:

(1) total scores

(2) communicative symbol

(3) closure-clarity, and

(4) proportion.

Hypothesis V. When pre-test scores are held constant there will be no significant difference between males and females in the experimental group on:

(1) total post-test scores

(2) communicative symbol: post-test

(3) closure-clarity: post-test, and

(4) proportion: post-test.

Hypothesis VI. There will be a significant difference between experimental and control groups in the amount of visual information contained in drawings of a trial object (wheelbarrow) on:

(1) total scores

(2) communicative symbol

(3) closure-clarity, and

(4) proportion.

Hypothesis VII. There will be a significant difference between experimental and control groups in the amount of visual information contained in drawings of an unfamiliar object (sculpture) on:

(1) total scores

(2) communicative symbol

(3) closure-clarity, and

(4) proportion.

Research Design

A pilot study was conducted to pre-test teaching devices, instructional procedures, suitability of stimulus objects, and rating scale. As a result of the pilot study the rating scale was refined, one stimulus object was replaced and it was decided to test the effects

of perceptual training on an unfamiliar object. Subsequent to the pilot study the following procedures were used to test the hypotheses:

1. Two grade one classes were selected to participate in the eight day experiment. To control for socio-economic differences and to minimize the effects of prior training, the sample was selected from a school in which both groups received art instruction from the same teacher. The two groups were also considered comparable on the basis of age and I.Q. estimates.
2. One class was designated as the experimental group and the other as the control group on the basis of a coin toss.
3. All instruction was conducted by the researcher under normal classroom conditions.
4. All known instructional variables were held constant with the exception of perceptual training.
5. The perceptual training offered the experimental group consisted of sequential demonstration-participation activities in locating and differentiating between points of maximal contour information prior to drawing visual objects.
6. The control group was given controlled drawing activities in drawing the same visual objects as the experimental group.

7. A total of 294 drawings for evaluation were obtained from the test lessons.
8. The drawings were rated by the researcher and three other judges on the basis of a fifteen point rating scale developed by Salome, (1964).

Analysis and Discussion of Data

Coefficients of Inter-Judge Reliabilities. To determine the level of agreement between judges on use of the rating scale, reliability coefficients were determined. The obtained reliability coefficients indicated a high level of agreement amongst judges on instrument use.

Hypothesis I. Hypothesis I was tested with an analysis of covariance, using post-test scores as the criterion and pre-test scores as the variate to determine the effect of treatment on post-test scores. The results of the analysis indicated that there were no significant differences between the experimental and control groups on post-test scores with pre-test scores held constant. However the F ratios for proportion on the bird drawings approached the .05 significance level.

Hypothesis II. Hypothesis II was tested with an analysis of covariance, using post-test scores as the criterion and I.Q. estimates as the variate to determine the effect of treatment on post-test scores. The results of the analysis indicated that there were no significant differences between the experimental and control

groups on post-test scores with I.Q. estimates held constant. However, the F ratios for proportion on bird drawings approached the .05 level of significance.

Hypothesis III. A correlated t-test was used to test hypothesis III. The t-test comparing the difference between pre and post-test scores for the experimental group, revealed no significant differences. It was noted, however, that the greatest difference between pre-mean scores and post-mean scores appeared on the proportion criterion for bird drawings.

As a result of testing hypotheses I, II, and III the tentative conclusion was that perceptual training had no significant effect on the experimental group's ability to render representational drawings of the bird and drum. However, there was an indication that the perceptual training may have increased the student's ability to delineate the bird with respect to proportion.

It is thought that the experimental group's increase on the proportion criterion for bird drawings was due to the fact that treatment affected the student's conception of a bird. Attneave (1954) explains that perceptions are based upon information received from stimuli and presumptions growing out of past experiences with objects. As the child grows older, earlier experiences result in habitual ways of perceiving. Through familiarity with birds and bird representations in pictorial form, students tend to have a steryotype image of birds. This image may be complete with respect to location of parts but is not necessarily correct in proportion. The perceptual training offered in this study may have caused the

children to perceive in a more selective manner thus affecting their conception of the bird with respect to proportion.

Hypothesis IV. Hypothesis IV was tested with a correlated t-test to determine if differences would occur between pre and post-tests for the control group. No significant differences were reported. However, the post-mean scores for the drum drawings were higher than the pre-mean scores and the total post-mean scores for the bird drawings were slightly lower than the total pre-mean scores.

Since the control group had no imposed method of perceiving stimulus objects the operating variable that affected their bird drawings may have been one of familiarity. As a result of familiarity the students may have developed habitual ways of perceiving birds. Thus the students drew what they knew rather than what they saw. The effects of familiarity plus an observed lack of interest in the post-test drawing assignment resulted in slightly lower post-test bird scores than pre-test bird drawing scores.

Lack of familiarity with drums on the other hand may have contributed to the apparent growth on post-test drum drawings. Since the students past experiences with drums was more limited than with birds they had not built up expectations or sets and therefore were unable to rely on memory when drawing the drum. As a result, the students had to look at the object during the drawing process and consequently their second drawings showed growth.

Hypothesis V. An analysis of covariance was conducted to determine if treatment caused significant differences between males and females. The results showed no significant differences.

The first five hypotheses were tested on the results obtained from analysis of post-test bird and drum drawings. An apparent lack of interest by the students on post drawing activities, however, is believed to have had an influence on the outcome of post-test scores. The results based on post-test scores are therefore not considered to be completely reliable.

Hypothesis VI. A one-way analysis of variance was conducted to determine the effect of treatment on a drawing other than the post-test items. The wheelbarrow drawings from lesson six were used for this analysis and they were designated as trial drawings. Highly significant differences between the experimental group scores and control group scores appeared as a result of the analysis.

These results indicate that treatment had an immediate effect on the child's ability to produce representational drawings of the wheelbarrow.

Hypothesis VII. Hypothesis VII was tested with a one-way analysis of variance to determine if there were significant differences between experimental and control groups on drawing scores of an unfamiliar object. A non-objective sculpture was used for this analysis. The results of the test showed highly significant differences between the two groups with probabilities exceeding

the .01 significance level. The highly significant differences between experimental group scores and control group scores suggest that perceptual training relevant to points of maximal information did increase the experimental group's ability to make representational drawings.

The analyses of wheelbarrow and sculpture drawings show that treatment did affect the experimental group's ability to render representational drawings. Since the experimental and control groups are comparable on age, I.Q. estimates, and socio-economic status, and because the two groups previously received art instruction from the same teacher, it is concluded that the highly significant difference between experimental and control group scores on wheelbarrow and sculpture drawings was due to treatment. The results obtained from the wheelbarrow drawings suggest that perceptual training directed towards locating and differentiating points of maximal information had a direct and immediate influence on the amount of visual information the children included in their drawings. Prior to delineation of sculpture drawings it is noted that the experimental group did not receive any direct perceptual training. (See Appendix 2 Lesson 8). There was a discussion about the object's parts and its use, but no reference was made to points of maximal information. One week had elapsed since perceptual training had been given. The results of sculpture drawing scores therefore indicate that perceptual learning occurred and that the knowledge gained was carried over a period of seven days and applied to an unfamiliar object.

In addition to testing the hypotheses, an analysis was conducted to determine the effects of treatment on I.Q. groups. The analysis showed that perceptual training had a greater effect on the high I.Q. group than the low or medium I.Q. groups as a result of scores obtained from bird and sculpture drawings. The drum and wheelbarrow drawing scores indicated that treatment was relatively equal in effect on I.Q. groups. The results however are based on the scores of only four experimental high I.Q. students and two control high I.Q. students.

Conclusions

The results of this study were mixed. Pre and post-test scores indicated that perceptual training relevant to the utilizations of visual cues located along contour lines does not increase the amount of visual information grade one children include in visual objects as measured by the experimental criteria. However, the analysis of wheelbarrow and sculpture drawings from the sixth and eighth lessons indicated that perceptual training does increase the amount of visual information first grade children include in drawings of visual objects as measured by the experimental criteria. The analysis of wheelbarrow drawings showed that the perceptual training had an immediate effect on the amount of visual information the children included in their drawings while the analysis conducted on sculpture drawings indicated that the effects of perceptual learning can be transferred to unfamiliar objects.

The researcher is of the opinion that relatively low post-test scores can be accounted for by a loss of interest on the

part of the students in post-test drawing assignments. Student comments, such as "We already drew the drum" and "I don't want to draw the bird again," indicated a lack of enthusiasm which may have affected their post-test drawing performance. It appears therefore that the repetition of drum and bird post-test drawings may not be reliable measures of perceptual growth.

The significant results obtained from analysis of wheelbarrow drawings indicated that perceptual training relevant to a particular object may have an immediate influence upon the amount of visual information a first-grade student includes in his drawings of stimulus objects. The results obtained from analysis of sculpture drawings indicated that perceptual training may increase the student's ability to delineate forms other than those to which the perceptual training was directed.

Although the results of testing hypotheses I, II and III indicated that perceptual training as presented in this study does not significantly enhance a child's ability to delineate more representational drawings, most students did make increased use of visual cues in representational drawings as a result of training. Observations disclosed that some students showed perceptual growth on selected drawing tasks while others showed growth throughout the study. While these findings are exploratory in nature, sufficient data and suggestive results were obtained to warrant continued investigation of this form of perceptual training.

In summary, this study indicated that while the results were mixed, perceptual training relevant to representational drawing

can increase the amount of visual information grade one children include in their drawings of visual stimuli. With the exception of the post-test drawing activities, the students appeared to maintain a high level of interest throughout the study. It follows that children may respond better to, and learn more from, some areas of the elementary art program if more structured content and direction were offered.

The results of the experiment showed that the children in the experimental group could control proportion and more accurately describe a stimulus object and its component parts than children in the control group.

The results obtained from the analysis of bird drawings suggests that perceptual training might improve the child's concept of familiar objects by causing him to engage in selected and intensive perceptual movement; that is, perceptual activity may contribute to the clearness and efficiency of visual concepts.

Implications for Art Education

The following tentative generalizations based on theory, research, and this study may serve to guide art education practices relevant to the teaching of perceptual training tasks.

1. Past experiences affect the way in which children handle visual information they receive in the classroom. Since these differences appear to be in large part learned, more adequate means of handling visual information can be taught. Consequently teachers can provide children with ways to improve visual

skills by including perceptual training as part of the art program.

2. Attneave (1954) posits that visual perception considered as an information handling process, involves dealing with redundant material far in excess of what can easily be coped with. Perceptual training therefore might help to increase a child's visual sensitivity by developing the ability to see and deal with visual detail in a selective manner.
3. Perceptual training need not be conceived merely as a means of increasing representational drawing abilities. Perceptual training is a way of increasing the child's ability to see, understand, and communicate with an art medium.
4. The results of this study indicated the possibility that children can make increased use of visual cues in representational drawings as a result of training to identify cues located in the contours of visual objects. However, it is not suggested that perceptual training tasks be limited to drawing. The development of visual perception may be better achieved through training tasks taught in conjunction with other phases of the visual arts such as painting, sculpturing, design, and photography.

5. Perceptual training as presented in this study may enhance a child's ability to delineate more representational drawings, however it need not confine or restrict the uniqueness and individuality of child art, and indeed, could very well lead to greater individual differentiation in handling visual material.
6. Judges noted that the level of differentiation of form and detail in the drawings could not be accurately assessed by mere observation. For example, many drawings that appeared to have a low level of differentiation of form and detail in fact scored high upon assessment. With the use of an assessment scale art teachers can therefore objectively determine the effect of their teaching strategy by comparing the differences in an individual's art product or response at the beginning with that at the end using the same assessment scale.

Although no significant differences were found between pre and post-test scores for either the experimental or control groups, this study did report relevant findings between group comparisons of the wheelbarrow and sculpture drawings; that is, it appears that relevant perceptual training can increase the first grade child's ability to render representational drawings. Little is known about how one teaches another to perceive and consequently further study needs to be done for the following reasons:

1. If perceptual training can increase the child's ability to make representational drawings,

perceptual training might have a positive effect on the child's ability in other areas of the visual arts.

2. It is well known that a great part of our perceptual ability is developed during the early years. Investigations of the relationships of age and various kinds of perceptual training may indicate growth periods when optimum effectiveness of perceptual training may occur.
3. If differences in perceptual ability do indeed partially account for individual differences in ability to learn skills and techniques fundamental to the development of visual expression then further investigation of perceptual training seems imperative.

Recommendations for Further Study

Research on the effects of perceptual training in art are limited and further study needs to be done. Considerations for further research should deal with the following problems which have arisen from this study.

1. The inconclusive results obtained from this study requires additional study at this level.
2. Conclusions of the experiment are based on only two samples of first grade children. Further investigations should utilize a number of schools to provide a larger and more representative

sampling upon which to base conclusions.

3. The experimental treatments should be presented to children at various grade levels to determine the optimum age for presentation of this kind of treatment.
4. Further investigations should be conducted by classroom teachers to determine the effectiveness of treatment under normal classroom conditions.
5. Prior learning relevant to socio-economic background may affect a child's response to the training used in this study. Therefore, samples should be drawn from various socio-economic groups.
6. The ambiguous results of testing I.Q. groups warrants further investigation with a larger sample.
7. An apparent lack of interest by the students on post-test drawing activities may have affected the reliability of the scores. Investigations should be conducted using an experimental design to eliminate this contamination. For example, the experimental design should provide for random assignment of individuals to the treatments so that students are required to draw a stimulus object only once.
8. While some of the results obtained were in the predicted direction, replications are needed at this level to provide a larger sample upon which to base conclusions.

9. The study should be undertaken over an extended period of time to determine the effect of treatment.
10. It should be determined if the type of treatment offered in this study affects other aspects of development such as creativity.
11. Further study may indicate a sequence of visual training experiences which would make art education more meaningful for children.

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APPENDICES

APPENDIX 1

STIMULUS AND TEST OBJECTS USED IN THE STUDY

Figure 4

DRUM USED IN PRE AND POST-TEST LESSONS

Figure 5

BIRD USED FOR PRE AND POST-TEST LESSONS

Figure 6

WAGON USED AS STIMULUS OBJECT IN LESSON TWO

Figure 7

BOAT USED AS STIMULUS OBJECT IN LESSON THREE

Figure 8

TOY DOG USED AS STIMULUS OBJECT IN LESSON FOUR

Figure 9

UKULELE USED AS STIMULUS OBJECT IN LESSON FIVE

Figure 10

WHEELBARROW USED AS STIMULUS AND
TEST OBJECT IN LESSON SIX

Figure 11

SCULPTURE USED AS STIMULUS AND
TEST OBJECT IN LESSON SEVEN

APPENDIX 2

EXPERIMENTAL AND CONTROL GROUP LESSONS

LESSON ONE: PRE-TEST

Stimulus Objects: Drum and Bird

Group: Experimental

Introduction: (five minutes) The researcher will say; "My name is Mr. Muirhead, and I will be having art with you each Wednesday and Friday for the next four weeks." Distribute name tags and explain that they are to help the researcher learn the names of the students more quickly. Distribute crayons and paper.

First Drawing: (ten minutes) Say; "I am going to ask you to make two pictures for me today. We will make them one at a time. On the first sheet of paper I want you to make a picture of this drum, (bring out the drum). Make the very best picture that you can; take your time and work very carefully. Draw the drum exactly as you see it here. Try very hard and see what good pictures you can make. Be sure you draw the whole drum - not just a part of it." After the first drawing offer a few words of praise, then have the students put their name on the back of the drawing.

Collect the drawings.

Second Drawing: (ten minutes) Say; "This time I want you to make a picture of this bird (bring out the bird). Make the very best picture that you can; take your time and work very carefully. Draw the bird exactly as you see it here. Try very hard and see what good pictures you can make. Be sure you draw the whole bird - not just part of it." After the second drawing again offer some words of praise and have the students put their names on the back of the drawing. Collect the pictures.

Comments: Encourage the children during the drawing time, but do not make suggestions. If children seek further instructions explain again that they are to draw the object just as it appears in front of them.

LESSON ONE - PRE-TEST

Stimulus Objects: Drum and Bird

Group: Control

Introduction: (five minutes) The researcher will say; "My name is Mr. Muirhead, and I will be having art with you each Wednesday and Friday for the next four weeks." Distribute name tags, and explain that they are to help the researcher learn the names of the students more quickly. Distribute crayons and paper.

First Drawing: (ten minutes) Say; "I am going to ask you to make two pictures for me today. We will make them one at a time. On the first sheet of paper I want you to make a picture of this drum (bring out the drum). Make the very best pciture that you can; take your time and work very carefully. Draw the drum exactly as you see it here. Try very hard and see what good pictures you can make. Be sure you draw the whole drum - not just a part of it." After the first drawing offer a few words of praise, then have the students put their name on the back of the drawing. Collect the drawings.

Second Drawing: (ten minutes) Say; "This time I want you to make a picture of this bird (bring out the bird). Make the very best picture that you can; take your time and work very carefully. Draw the bird exactly as you see it here. Try very hard and see what good pictures you can make. Be sure you draw the whole bird - not just part of it." After the second drawing again offer some words of praise and have the students put their names on the back of the drawing. Collect the pictures.

Comments: Encourage the children during the drawing time, but do not make suggestions. If children seek further instruction explain again that they are to draw the object just as it appears in front of them.

LESSON TWO

Stimulus Object: Wagon

Group: Experimental

Emphasize:

1. Contour lines are a source of information for seeing and drawing objects.
2. Before drawing an object it must be carefully observed.
3. Contour lines move into and describe shapes within major forms.

Instruction:

1. Explain that to identify an object information is needed. Often an object is identified by it's contour. Contour lines are outer edges or boundaries of forms.
2. Ask; "How do we identify contour lines?"
3. Demonstrate by first placing a red square of construction paper on a red background and secondly by placing the red square on a yellow background.

Activities:

1. Place a silhouette of the wagon on the overhead projector and have the students trace an imaginary line around it's contour with their finger.
2. Have a volunteer trace around the contour of the wagon with his finger.

Explain that the drawing can become more clear by adding other lines that are inside the outer boundary.

3. Have students produce a contour drawing by laying their hand flat on a piece of paper and tracing around it.
4. Have the students draw the wagon just as it appears before them.

LESSON TWO

Stimulus Object: Wagon

Group: Control

Emphasize: Drawing requires practice and training.

Introduction: Read the Story "Little Red Wagon"

Instruction:

1. Discuss the necessity of looking at objects before drawing them.
2. Ask; "How do we know this is a wagon?"
   "What is it made of?"
   "What colors are the different parts?"
3. Discuss the ways in which crayons can be used to draw the wagon.
4. Encourage students to ask questions.

Activity: Have the students draw the wagon just as it appears before them.

LESSON THREE

Stimulus Object: Boat

Group: Experimental

Emphasize: Points of maximal information in contour drawings are found where there are angle changes.

Instruction:

1. Discuss the necessity of "looking" before drawing. Ask; "What do we call the lines that are the outer edges or boundaries of forms?"
2. Stress that contour lines identify and are a part of the object. They are a source of information for seeing and drawing objects.
3. Using the overhead projector show a picture of a sailboat. Then with the use of an overlay place a contour drawing over the original. Finally remove the original picture so the contour drawing is showing by itself.

Activities:

1. Again show the picture of the sailboat on the screen by use of the overhead projector. Then ask for volunteers to come and point to where the contour lines

change direction (angles).

2. Point at the model of the boat and trace an imaginary contour line around its boundary.
3. Look for parts of the boat within the outer boundary.
4. Have students make a drawing of the model just as it appears before them.

LESSON THREE

Stimulus Object:	Boat
Group:	Control
Motivation:	Tell the story, Mud, Mud Mud. Illustrate the story with pictures that can be shown on the screen using the overhead projector.
Instruction:	1. Ask the students if they have ever sailed a toy boat. 2. Discuss the model - its parts, color, number of sails etc.
Activity:	Have students make a drawing of the model just as it appears before them.

LESSON FOUR

Stimulus Object: Toy Dog

Group: Experimental

Emphasize: Points of maximal information are found at angles and peaks of curvature.

Instruction:

1. Explain that objects are easier to draw if reference is made to the contour. Contour lines describe form which is the most important thing to record in drawing. Contour lines of some forms can be felt (i.e. desk)
2. Place a cardboard silhouette of the toy dog on the overhead projector. Trace around the silhouette pointing out angles and peaks of curvature. Remove the silhouette pointing out angles and peaks of curvature. Remove the silhouette so only the contour line drawing is exposed. Draw arrows at angles and peaks of curvature.

Activities:

1. Distribute a contour line drawing of the dog and a piece of tracing paper to each student. Then have the students trace the contour of the dog.

2. Distribute an incomplete line drawing to each student and have them complete the drawing.
3. Have students make a drawing of the dog just as it appears before them.

LESSON FOUR

Stimulus Object: Toy Dog

Group: Control

Introduction: Ask for volunteers to describe what a particular dog looks like. It may be the student's own dog or one that they know or like very much. Then bring out the toy dog and ask how this one differs from most real dogs.

Instruction:

1. Discuss the model. Ask; "What is it made of?" "What colors are in it?" "What do you think the dog is doing?"
2. Discuss the ways in which crayons can be used to draw the dog.

Activity: Have students draw the dog just as it appears before them.

LESSON FIVE

Stimulus Object: Ukulele

Group: Experimental

Emphasize: Sudden color changes make contour lines visible.

Introduction:

1. Show the ukulele to the students and then play a few chords.
2. Ask the students if they know what this instrument is.
3. Ask the students if they would like to sing. (Possible songs to sing, "Dog Named Wags," "Bumble Bee," "She'll be Coming Round the Mountain.")

Instruction:

1. Show a line drawing of the ukulele on the screen using the overhead projector. Point out the parts and where lines are caused by color change.
2. Using a black felt pen trace around the contour of the ukulele. Then using a blue felt pen trace around the contour of the parts within the outer boundary. Show where lines change direction and where lines connect with arrows.

Activity:

1. Ask; "What shapes can be found in the ukulele?" "How many strings does it have?" "Where do the strings go?"
2. Make drawings of the shapes that can be found in the ukulele.
3. Have the students produce a drawing of the ukulele just as it appears before them.

LESSON FIVE

Stimulus Object:	Ukulele
Group:	Control
Introduction:	Same as for experimental group.
Instruction:	1. Discuss the parts of the ukulele. Tell the students the function of each part. 2. Ask the students if they know any other instruments that have the same parts. Then ask how it differs from the ukulele.
Activity:	Have the students produce a drawing of the ukulele just as it appears before them.

LESSON SIX

Stimulus Object:	Wheelbarrow
Group:	Experimental
Review:	The importance of referring to contours and boundaries for essential bits of information prior to delineating visual symbols.
Instruction and Activity:	Expose a line drawing of the wheelbarrow on the screen using an overhead projector. The researcher will begin tracing slowly around the outer boundary of the drawing. At the points of maximal information (angles and peaks of curvature the students are to say "stop.") Discuss the parts of the wheelbarrow. Refer to the shape and relative size of each part. Have the students draw the wheelbarrow just as it appears before them.

LESSON SIX

Stimulus Object:	Wheelbarrow
Group:	Control
Instruction:	1. Discuss with the students the uses of a wheelbarrow. 2. Discuss with the students the parts of the wheelbarrow and the function of each part.
Activity:	Have the students draw the wheelbarrow exactly as they see it.

LESSON SEVEN POST-TEST

Stimulus Objects: Drum and Bird

Group: Experimental

Instruction: Explain to the students that this is the last lesson we will be doing together and tell them how pleased you are with their drawings. Tell the children that you have seen a great improvement in their drawings and you would like to see how well they can draw the bird and drum now.

First Drawing: "Remember today we are going to make two pictures. We will make them one at a time. On the first sheet of paper I want you to make a picture of the drum. Make the very best picture that you can; take your time and work very carefully. Draw the drum exactly as you see it here. Try very hard and see what good pictures you can make. Be sure you draw the whole drum - not just part of it." At the end of the time allotment, offer a few words of praise, then have the children put their name on the back of the drawing and hand them in to the instructor.

Second Drawing: Say; "This time I want you to make a picture of the bird. Make the very best picture that you can; take your time and work very carefully. Draw the bird exactly as you see it here. Try very hard and see what good pictures you can make. Be sure you draw the whole bird not just part of it." After the alloted time again offer some words of praise and have the students put their names on the back of the drawing. Collect the drawings.

Comments:

1. Encourage the children during the drawing time, but do not make suggestions.
2. If children seek further instructions explain again that they are to draw the object just as it appears in front of them.

LESSON SEVEN POST-TEST

Stimulus Object:	Drum and Bird
Group:	Control
Instruction:	Explain to the students that this is the last lesson we will be doing together and tell them how pleased you are with their drawings. Tell the children that you have seen a great improvement in their drawings and you would like to see how well they can draw the bird and drum now.
First Drawing:	Say; "Remember today we are going to make two pictures. We will make them one at a time. On the first sheet of paper I want you to make a picture of the drum. Make the very best picture that you can; take your time and work very carefully. Draw the drum exactly as you see it here. Try very hard and see what good pictures you can make. Be sure you draw the whole drum - not just part of it." At the end of the time allotment, offer a few words of praise, then have the children put their name on the back of the drawing and hand them in to the instructor.

Second Drawing: Say; "This time I want you to make a picture of the bird. Make the very best picture that you can; take your time and work very carefully. Draw the bird exactly as you see it here. Try very hard and see what good pictures you can make. Be sure you draw the whole bird not just part of it." After the alloted time, again offer some words of praise and have the students put their names on the back of the drawing. Collect the drawings.

Comments:

1. Encourage the children during the drawing time, but do not make suggestions.
2. If children seek further instructions explain again that they are to draw the object just as it appears in front of them.

LESSON EIGHT

Stimulus Object: Sculpture

Group: Experimental

Motivation:

1. Ask the students what they think this (sculpture) is or what it might be used for.
2. Explain that it has no real function. It is just to look at and touch.
3. Allow the children to touch the object and then ask them to look at it very carefully before beginning to draw it.
4. Also stress to the students the importance of continually looking at the object while drawing it.

Activity: Have the students draw the object exactly as they see it.

LESSON EIGHT

Stimulus Object: Sculpture

Group: Control

Motivation:

1. Ask the students what they think this (sculpture) is or what it might be used for.
2. Explain that it has no real function. It is just to look at and touch.
3. Allow the children to touch the object and then ask them to look at it very carefully before beginning to draw it.
4. Also stress to the students the importance of continually looking at the object while drawing it.

ACtivity: Have the students draw the object exactly as they see it.

APPENDIX 3

GENERAL INFORMATION FOR JUDGES

GENERAL INFORMATION FOR JUDGES

The purpose of this research is to determine what effect a specific kind of perceptual training will have upon the amount of visual information grade one children include in their drawings. The rating scale will be used to analyze the drawings in terms of the following variables:

Communicative Symbol - The degree to which a drawing communicates the characteristics of the given stimulus object is based upon the amount of maximal contour information relevant to that object which the child includes in his drawing. Points of maximum information may be located in contour lines at angles caused by sudden direction change, peaks of curvature, and places of abrupt color or texture change. The more of these points and changes included in a drawing the higher the rating given on this variable.

Closure Clarity - This variable describes the degree of organization achieved through the closure of line which remains sensitive to characteristic linear movement found in the contour of the stimulus and its component parts. Judgements pertaining to closure clarity are to be based upon the extent to which the form and its component parts are enclosed by line which describes straight and curved edges relevant to the object. The more parts enclosed by the line which describes straight and curved edges of an object and its parts, the higher the rating given on this variable.

Proportion - This variable is concerned with height, width, and size relationships of parts to the whole. Judgements concerning proportion are based upon the extent ot which the height, width, and size of the stimulus object and its parts have been indicated and interrelated in the drawing. The greater the number of parts accurately proportioned and interrelated, the higher the rating given on this variable.

When scoring the drawings please note the following information:

1. Read the criteria literally; avoid aesthetic evaluations which do not pertain to the scale.
2. Do not attempt to rate what is not shown in the drawings.
3. If the bottom edge of the paper is used as a base line give credit. Don't confuse this with running an oversized shape off the paper.
4. The subjects were asked to draw only a side view of the stimulus objects. Don't subtract or add to the drawing score for parts in excess of a two-dimensional view.
5. The subjects are not expected to make ruler straight lines or compass round circles. They should be able to indicate both.
6. Credit is given fcr locating line caused by color change if a child fills in with black or solid color rather than using two lines.

7. A drawing may have points on one side but not the other. Give credit for those included if correctly located.
8. If the child has been ambiguous about differentiating between angles and curves, the scale provides for this (see under closure clarity.)
9. The subjects were not asked to replicate the colors of the stimulus objects. Color usage is therefore irrelevant when scoring.
10. When in doubt about a score, assign the lower number.

APPENDIX 4

JUDGE INFORMATION FOR RATING TEST ITEMS

RATING SCALE

DIRECTIONS: Each of the three criteria listed below is followed by five descriptive statements indicating the degree to which a drawing may have achieved that criterion. On your scoring sheet for each drawing circle the number by the one statement which best describes the drawing with respect to the particular criterion. Evaluate for all three criteria.

COMMUNICATIVE SYMBOL: The drawing communicates the characteristics of the stimulus object through accurate location of and differentiation between maximal information points found at; (1) angles, (2) peaks of curvature, (3) lines caused by abrupt color or texture changes.

5 -- Locates and differentiates between almost all (minor errors)

4 -- Locates and differentiates between most (up to 1/3 missing).

3 -- Locates and differentiates between more than 1/2 points.

2 -- Locates and differentiates between less than 1/2 points.

1 -- Locates and differentiates between only a few (over 2/3 missing.)

CLOSURE-CLARITY: A sense of organization is achieved through the closure of line, which remains sensitive to characteristic linear movement found in the contour of the form. The form and component parts are enclosed by line which describes straight and curved edges relevant to the shape of parts in the object.

5 -- All parts enclosed by lines which are relatively accurate in

describing straight and curved edges of shapes.

4 -- One or two minor parts not included by line; nearly all straight and curved edges of shapes indicated.

3 -- Greatest part of major and minor forms are enclosed; most straight and curved edges indicated.

2 -- Little closure of either major or minor form; straight and curved edges uncertain, and or several component parts left out (1/3 to 1/2).

1 -- Very little closure of major form, and or, many parts missing, lines irrelevant to shape of object.

PROPORTION: This variable is concerned with height, width and size relationships of parts to the whole. Evaluate on the accuracy with which height, width, and size of the parts of the stimulus object have been indicated and interrelated.

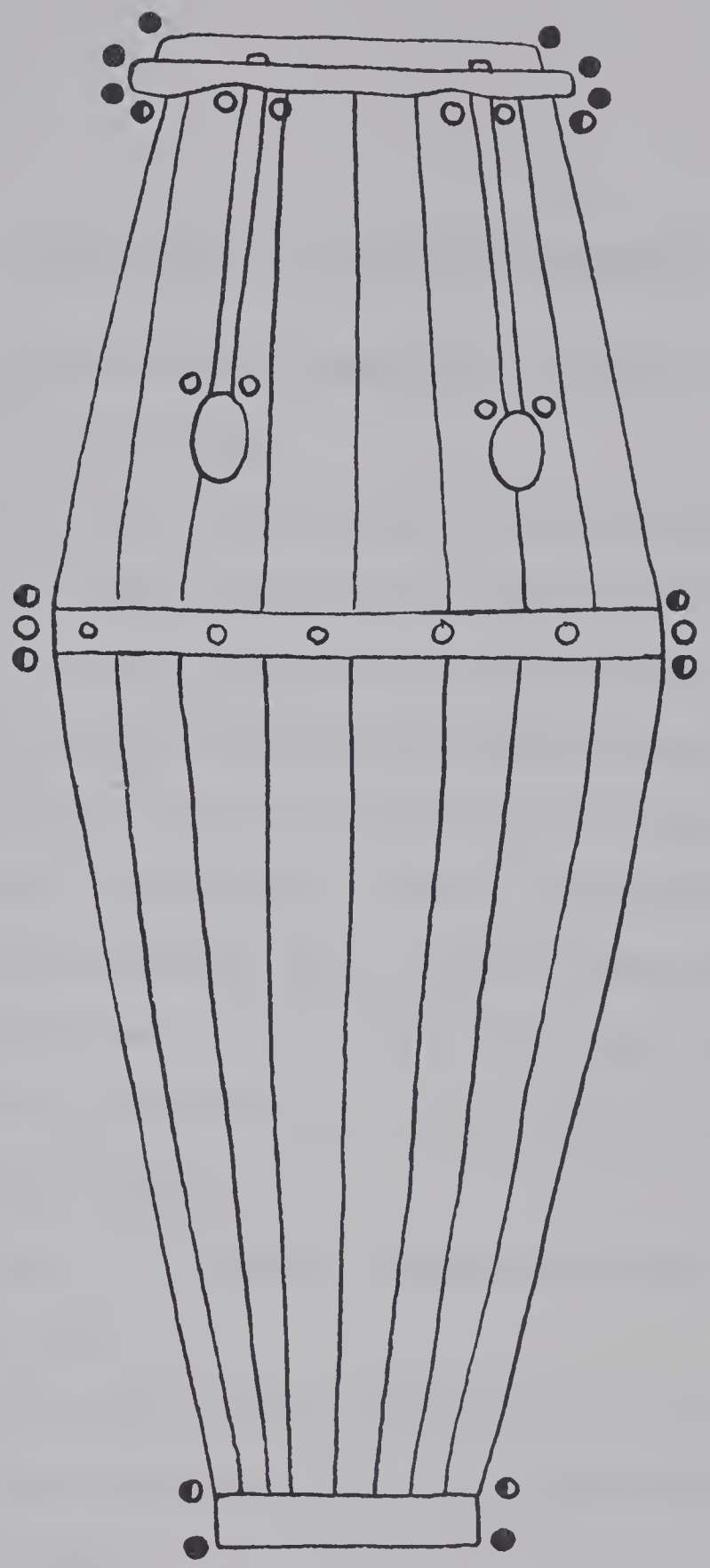
5 -- Proportion of all parts relatively accurate and inter-related.

4 -- Proportion of most parts relatively accurate and inter-related.

3 -- Proportion of parts fairly well indicated and inter-related.

2 -- Major mistakes in some height-width size relationships.

1 -- Inaccurate indication and inter-relation of all parts proportionately.



0 peak of curvature
● angles
0 lines caused by color change

Figure 12

DRAWING OF DRUM SHOWING LOCATION AND DIFFERENTIATION OF CONTOUR INFORMATION POINTS USED FOR SCORING DRUM DRAWINGS

INFORMATION FOR SCORING DRUM DRAWINGS

1. Scoring for points under "Communicative Symbol." The drum has a total of 30 points.

   5 -- 26 to 30 points indicated and differentiated.

   4 -- 21 to 25 points indicated and differentiated.

   3 -- 16 to 20 points indicated and differentiated.

   2 -- 11 to 15 points indicated and differentiated.

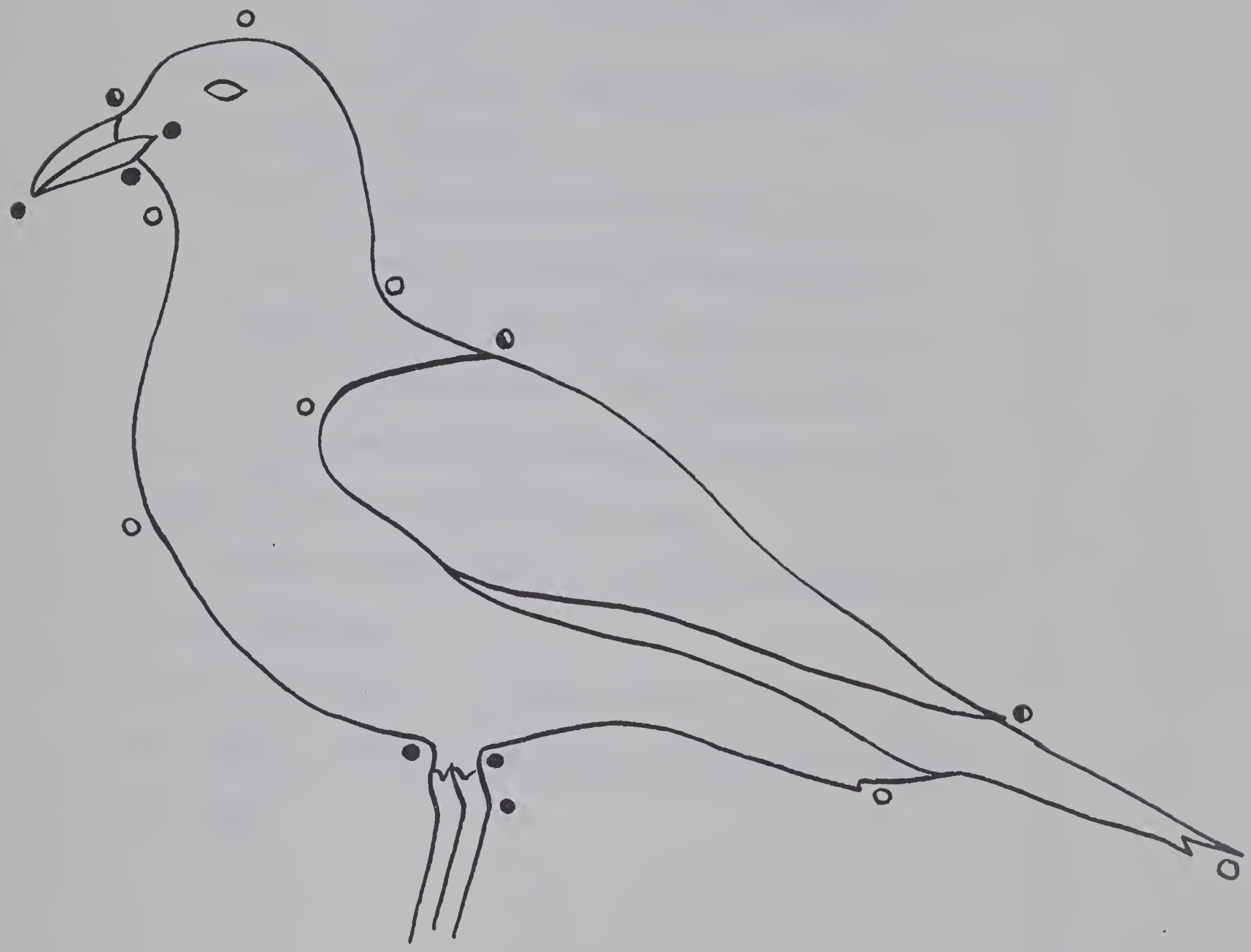
   1 -- less than 11 points indicated and differentiated.

2. Score 1 point if the subject correctly indicates the lines caused by the different colored strips of wood running lengthwise down the drum. Do not give credit if the lines run diagonally or horizontally or if they do not extend all the way from top to bottom.

3. Score 1 point if the subject indicates the holes located in the central band.

4. Score 1 point if the subject indicates the circular shapes at the end of each tightening rod. Do not give credit for more than two of these.

5. Parts of the Drum: (1) head, (2) chrome portion that encircles the head, (3) tightening rods, (4) central band, (5) band at the base, (6) body of drum composed of wooden slats.



0 peak of curvature
● angles
◐ lines caused by color change

Figure 13

DRAWING OF BIRD SHOWING LOCATION AND DIFFERENTIATION OF CONTOUR INFORMATION POINTS USED FOR SCORING BIRD DRAWINGS

INFORMATION FOR SCORING BIRD DRAWINGS

1. Scoring for points under "Communicative Symbol." The bird has a total of 18 points.

   5 -- 16 to 18 points indicated and differentiated.

   4 -- 13 to 15 points indicated and differentiated.

   3 -- 10 to 12 points indicated and differentiated.

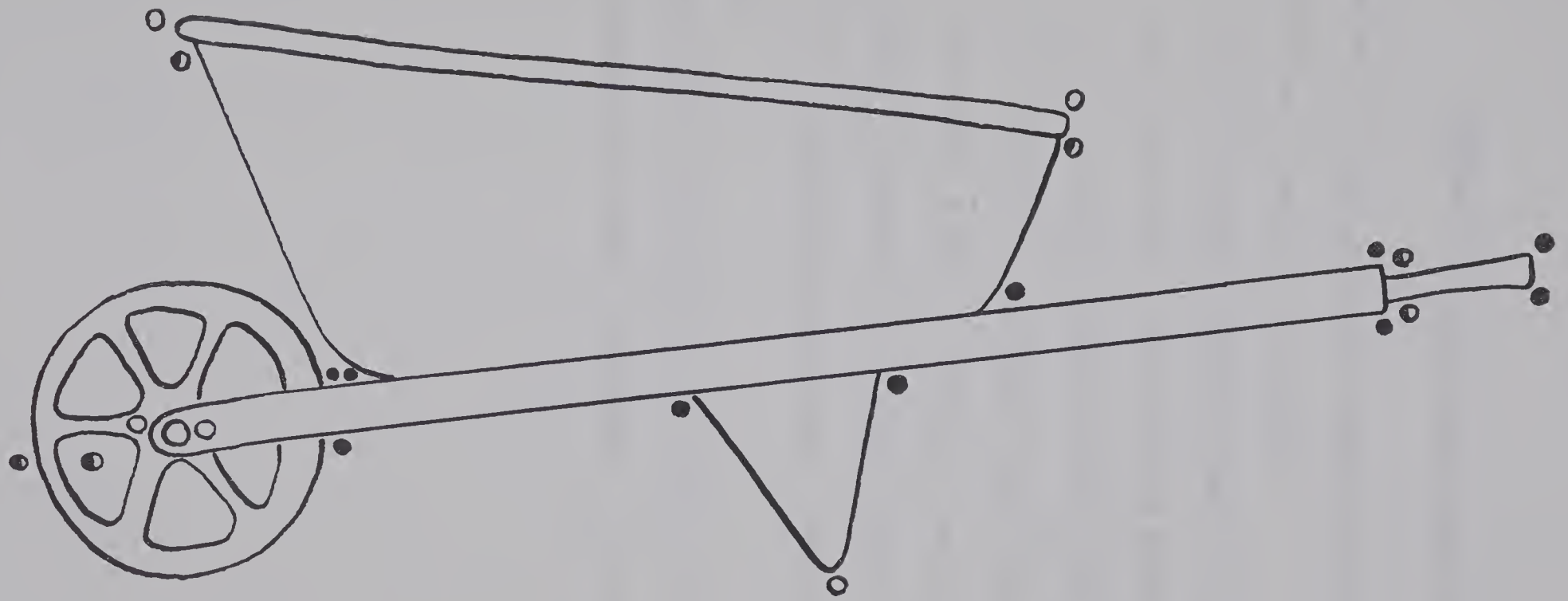
   2 -- 6 to 9 points indicated and differentiated.

   1 -- less than 6 points indicated and differentiated.

2. Score 1 point for indication of eye.

3. The subject may have shown 1 or 2 legs depending on his viewing position.

4. Parts of the bird: (1) beak, (2) eye, (3) head, (4) neck, (5) breast, (6) wing, (7) black tail feathers, (8) rump, (9) legs.



0 peak of curvature
● angles
0 lines caused by color change

Figure 14

DRAWING OF WHEELBARROW SHOWING LOCATION AND DIFFERENTIATION OF CONTOUR INFORMATION POINTS USED FOR SCORING WHEELBARROW DRAWINGS

INFORMATION FOR SCORING WHEELBARROW DRAWINGS

1. Scoring for points under "Communicative Symbol." The wheelbarrow has a total of 21 points.

   5 -- 19 to 21 points indicated and differentiated.

   4 -- 16 to 18 points indicated and differentiated.

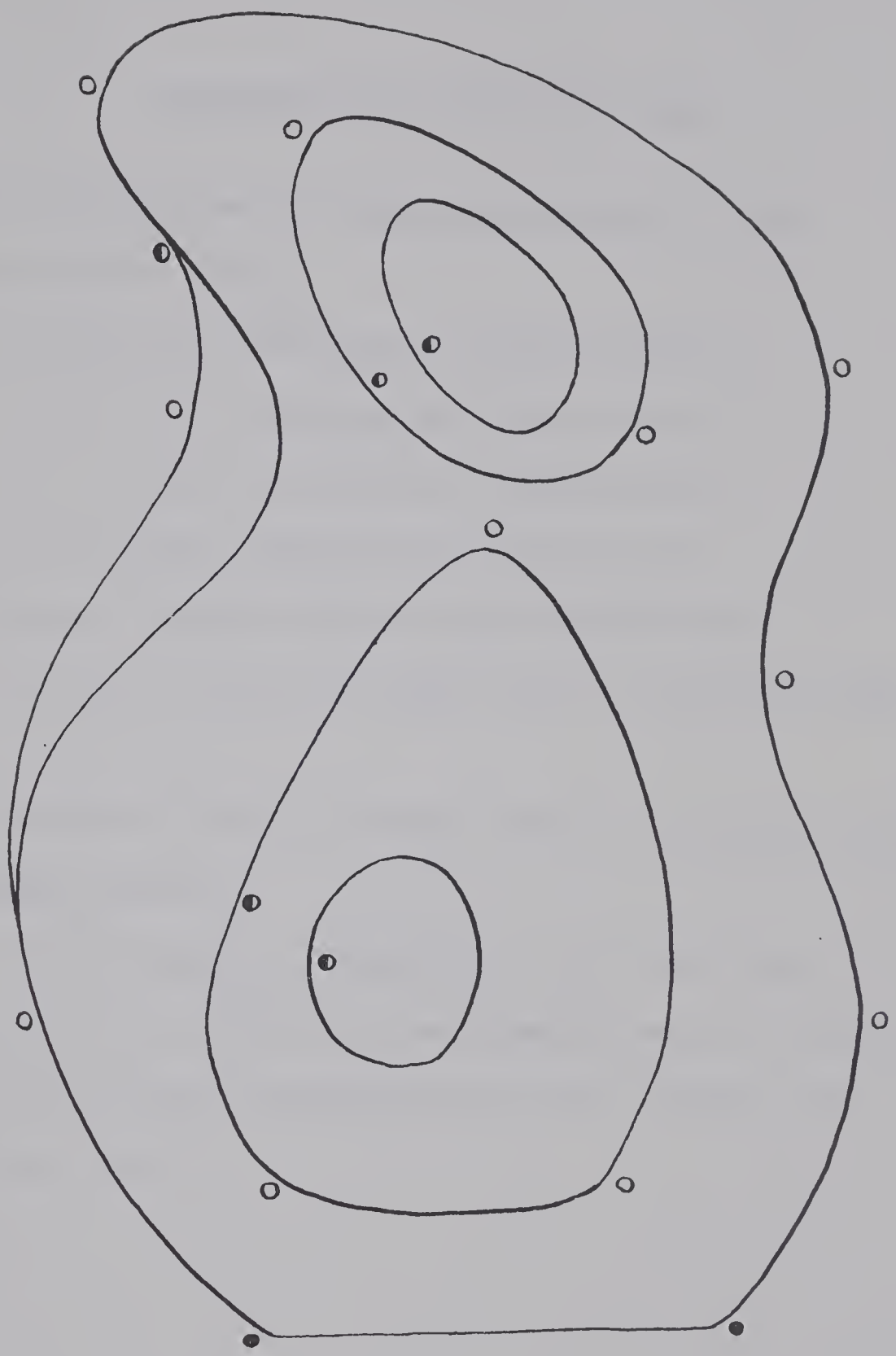
   3 -- 12 to 15 points indicated and differentiated.

   2 -- 8 to 11 points indicated and differentiated.

   1 -- less than 8 points indicated and differentiated.

2. The wheel is scored on a 3 point basis: 1 for the outer rim; 1 for the redundant spoke shapes; and 1 for the circle at the axle.

3. Parts of the wheelbarrow: (1) wheel, (2) box, (3) bar extending from wheel to handle, (4) handle, (5) triangular support.



0 peak of curvature
● angles
0 lines caused by color change

Figure 15

DRAWING OF SCULPTURE SHOWING LOCATION AND DIFFERENTIATION OF CONTOUR INFORMATION POINTS USED FOR SCORING SCULPTURE DRAWINGS

INFORMATION FOR SCORING SCULPTURE

1. Scoring for points under "Communicative Symbol." The sculpture has 19 points.

   5 -- 17 to 19 points indicated and differentiated.

   4 -- 14 to 16 points indicated and differentiated.

   3 -- 11 to 13 points indicated and differentiated.

   2 -- 7 to 10 points indicated and differentiated.

   1 -- less than 7 points indicated and differentiated.

2. Score 1 point for the color change caused by the rim at each hole.

3. Score 1 point for the color change caused by the darker portion surrounding each hole.

4. Parts of the sculpture: (1) upper half, (2) lower half, (3) top hole, (4) dark area surrounding the hole, (5) bottom hole, (6) dark area surrounding bottom hole, (7) dark area on left hand side.

APPENDIX 5

EXAMPLE OF SCORING SHEET

SCORING SHEET

DRAWING _____ JUDGE _____

Communicative Symbol	1	2	3	4	5
Closure. Clarity	1	2	3	4	5
Proportion	1	2	3	4	5

APPENDIX 6

MASTER DATA SHEETS

TABLE 9

DATA FROM CONTROL GROUP

SUBJECT			DRUM PRE-TEST				DRUM POST-TEST				BIRD PRE-TEST				BIRD POST-TEST				WHEELBARROW				SCULPTURE			
CASE NUMBER	SEX	IQ SCORE	COMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE	COMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE	COMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE	CUMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE	COMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE	COMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE
26	F	99	1	1	2	04	3	3	3	09	2	3	2	07	2	2	2	06	4	4	3	11	2	2	2	06
27	F	117	2	2	2	06	2	3	3	08	2	3	2	07	2	2	2	06	2	2	2	06	1	1	1	03
28	F	112	1	2	2	05	1	1	1	03	2	2	2	06	2	1	1	04	2	1	1	04	1	2	2	05
29	F	118	2	3	3	08	3	3	3	09	2	3	3	08	3	2	2	07	2	2	1	05	2	2	2	06
30	F	112	2	2	2	06	2	3	2	07	2	2	2	06	2	2	2	06	3	3	3	09	2	2	2	06
31	F	92	3	2	2	07	3	3	3	09	2	2	2	06	2	2	2	06	4	3	3	10	2	2	2	06
32	F	133	1	2	2	05	1	2	2	05	2	3	3	08	2	2	2	06	2	3	2	07	4	3	3	10
33	F	85	1	1	1	03	1	1	2	04	2	1	1	04	1	1	1	03	2	2	1	05	1	2	2	05
34	F	91	2	2	1	05	1	1	1	03	3	3	2	08	2	2	2	06	3	2	3	08	1	1	1	03
35	F	86	1	1	1	03	1	1	1	03	1	2	2	05	2	2	3	07	2	2	1	05	1	2	2	05
36	F	135	1	1	1	03	1	1	1	03	1	1	1	03	1	1	1	03	2	2	1	05	1	1	1	03
37	M	104	1	1	2	04	1	2	2	05	2	1	2	05	1	1	1	03	2	2	2	06	1	2	2	05
38	M	99	2	2	2	06	3	2	2	07	3	3	2	08	2	2	2	06	2	2	1	07	1	1	1	03
39	M	101	1	1	1	03	1	1	1	03	1	1	1	03	1	1	1	03	1	1	1	03	1	1	1	03
40	M	111	2	2	2	06	1	2	2	05	3	3	3	09	2	2	2	06	3	2	3	08	2	1	2	05
41	M	96	2	2	2	06	1	1	1	03	1	1	1	03	2	2	2	06	2	2	2	06	1	2	2	05
42	M	112	1	1	1	03	2	2	2	06	2	2	2	06	3	3	3	09	2	2	2	06	3	2	2	07
43	M	100	3	3	3	09	3	3	2	07	3	3	3	09	3	4	4	11	3	3	3	09	2	2	2	06
44	M	111	1	1	2	04	2	2	2	06	2	2	2	06	3	3	2	08	2	2	2	06	1	1	1	03
45	M	99	2	2	2	06	3	3	3	09	2	2	2	06	2	1	2	05	3	3	3	09	2	2	2	06
46	M	94	1	1	1	03	1	1	1	03	1	1	1	03	2	2	2	06	2	2	2	06	1	1	1	03
47	M	102	2	3	3	08	3	3	4	10	3	4	3	10	2	2	2	06	4	3	3	10	2	2	2	06
48	M	111	2	2	2	06	3	2	2	07	1	2	2	05	3	2	2	08	1	3	3	09	2	2	2	06
49	M	90	1	1	1	03	1	1	1	03	2	2	1	05	2	2	2	06	1	2	1	04	2	2	2	06

TABLE 10

DATA FROM EXPERIMENTAL GROUP

			DRUM PRE-TEST				DRUM POST-TEST				BIRD PRE-TEST				BIRD POST-TEST				WHEELBARROW				SCULPTURE			
CASE NUMBER	SEX	I.Q SCORE	COMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE	COMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE	COMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE	COMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE	COMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE	COMMUNICATIVE	CLOSURE-CLARITY	PROPORTION	TOTAL SCORE
1	M	111	1	1	2	04	2	2	2	06	2	2	2	06	2	2	3	07	3	4	3	10	3	2	2	07
2	M	092	3	3	3	09	4	3	3	10	3	3	2	08	2	2	2	06	5	4	4	13	4	3	3	10
3	M	109	2	3	2	07	2	2	2	06	1	1	1	03	3	3	3	09	3	3	3	09	3	3	2	08
4	M	129	2	3	2	07	3	3	2	08	2	2	2	06	2	2	2	06	4	4	3	11	4	3	3	10
5	M	102	2	2	2	06	1	1	2	04	2	3	2	07	2	2	3	07	2	3	3	08	2	2	2	06
6	M	107	2	2	2	06	1	2	2	05	2	2	2	06	2	2	2	06	4	3	2	09	2	2	2	06
7	M	107	1	3	3	07	1	2	2	05	2	3	2	07	3	3	2	08	3	3	3	09	2	2	3	07
8	M	097	2	3	2	07	1	1	2	04	3	4	4	11	2	3	3	08	4	3	2	09	4	3	3	10
9	M	105	1	2	3	06	3	3	2	08	2	3	2	07	2	2	2	06	4	4	3	11	4	2	2	08
10	M	102	1	2	1	04	2	3	3	08	2	2	2	06	1	1	1	03	4	4	3	11	2	2	2	06
11	M	079	1	1	1	03	1	1	1	03	3	3	3	09	2	2	2	06	4	3	3	10	3	2	2	07
12	F	121	3	3	3	09	1	2	2	05	2	3	3	08	1	2	2	05	5	4	3	12	3	3	2	08
13	F	116	2	3	3	08	4	3	4	11	3	3	4	10	2	3	3	08	3	3	3	09	4	5	4	13
14	F	105	3	3	3	09	3	3	2	08	2	1	1	04	1	1	1	03	5	4	5	14	5	5	5	15
15	F	074	2	2	2	06	2	2	2	06	2	2	2	06	2	3	3	08	3	3	2	08	2	2	2	06
16	F	097	1	1	1	03	1	1	1	03	2	2	2	06	3	3	3	09	3	3	2	08	2	2	2	06
17	F	120	2	2	2	06	3	3	3	09	2	3	2	07	3	3	3	09	4	3	3	10	3	3	3	09
18	F	119	2	3	2	07	1	2	2	05	1	1	1	03	2	2	2	06	3	3	3	09	3	3	3	09
19	F	101	2	2	2	06	2	3	2	07	1	1	1	03	1	1	1	03	2	3	3	08	2	2	2	06
20	F	092	1	1	1	03	1	1	1	03	1	2	1	04	1	2	1	04	3	2	2	07	3	3	2	08
21	F	081	1	1	1	03	1	1	1	03	1	1	1	03	2	2	3	07	2	2	2	06	1	1	1	03
22	F	095	1	2	2	05	2	3	3	08	3	3	2	08	2	3	2	07	4	3	2	09	3	2	2	07
23	F	125	2	2	2	06	2	3	3	08	2	2	2	06	3	3	3	09	4	4	3	11	3	3	2	08
24	F	133	3	2	2	07	3	4	3	10	2	2	2	06	2	2	2	06	4	4	3	11	4	4	4	12
25	F	100	3	4	4	11	3	3	3	09	2	3	2	07	2	2	2	06	4	3	4	11	4	3	3	10